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OBSERVATIONS ON THE EFFECTS OF DIATHERMY IN OSTEOMYELITIS*

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Where chronic traumatic osteomyelitis is a sequel to a fracture, the ideal towards which every remedial effort is directed includes (1) the earliest possible arrest of the infection; (2) the promotion of early sound union, which will provide the greatest attainable bone strength necessary to furnish a maximum function; (3) the earliest possible mobilization of the muscles and joints; (4) the earliest possible correction of deformities of union; (5) the earliest possible treatment of complications and residual disabilities. According to the type of fracture, the time which elapses between the successful arrest of the chronic infective process and the achieving of sound and functionally useful union will vary considerably. Most usually union proceeds even though the infective process remains. Indeed, in some of these cases it would seem as if the persistent irritation, undoubtedly chemical, furnished by the chronic septic process, acts often as a factor highly stimulative to union. At other times, especially so in cases of fracture of the shaft of the humerus, or a comminuted

fracture with much periosteal destruction involving one of a pair of bones such as the radius and ulna, spontaneous union is not expected. In all cases the accomplishment of a result which will reasonably assure freedom from recurrence of bone diseases, from the formation of new abscesses, and from the reopening of old wounds, implies and necessitates the fulfillment of four conditions: (1) sequestra and all foreign bodies must be removed, either through their spontaneous emergence or by surgical intervention; (2) the removal of all areas of carious and infected bone; (3) the elimination of all mechanical obstacles to healing, such as cavities, tunnels of bone, chronic sinuses through the soft parts, and the like; (4) the prevention of the formation of dense bands of scar tissue.

It is rather easy to understand how attention to the conditions just described should be conducive to complete success. Nevertheless, surgeons and others realize full well that a final cure is only too often exacting of the highest possible skill, careful and experienced judgment, and ceaselessly constant attention and tedium. Certainly anyone who has treated chronic disease of the femur will instantly agree that this is so.

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The total bone loss in an infected traumatic fracture, which may develop into a case of osteomyelitis, is the sum of (1) loss due to actual violence and (2) loss due to original and later stages of infection. It must be emphasized that the bone volume is not only lost, but that also there is a corresponding loss of a potential source of new bone required in the process of repair. Just here is a value, in a very large measure, in the use of diathermy. Everyone is familiar with Van t' Hoff's generalization—that a rise in temperature of one degree centigrade is accompanied by an increase of ten per cent in the velocity of any chemical reaction capable of being accelerated. If, now, the bone contiguous to the area in which the loss has occurred is gently heated through the use of diathermy, the osteogenetic quality of the osteoblasts contained, as Macewen has recently shown, in the lacunae is much stimulated. By the stimulating to overaction of many osteoblasts in the adjoining contiguous bone it is possible chemically to overcompensate in bone recreative action for the loss due to the lost bone. No surgical procedure yet devised has been shown to furnish the borrowed extraordinary reparative stimulation that diathermy clinically affords in these cases borrowed, that is, from the adjacent healthy structure. This "borrowed action" is decidedly helpful, and its value cannot be overestimated. It is indigenous to diathermy alone.

We return for a moment to the well recognized fact mentioned previously, that quite often the persistent sepsis acts as a chemical stimulant conducive to union. Van t' Hoff's generalization again applied. Gentle intensification of the chemical septic process, accomplished by diathermy, hastens the union and repair in remarkable degree. In this connection I wish to emphasize a principle in the use of diathermy in the treatment of chronic osteomyelitis—a principle which appears to have escaped notice, so far as I can learn, and which, if unheeded, may definitely ruin the success of the applica-

tion. I think it is doubtful to expect heating of a bone buried in soft tissue to the point where thermal *destruction* of the invading organisms can occur immediately as the result of heat on bacteria. If prolonged, intensive diathermy treatment is applied in these cases in the futile attempt to achieve a sterilization of the bone, not only is sterilization not achieved, but the entire value of diathermy treatment is lost, and even reversed. Doubtless the stimulating action of sepsis is an enzyme affair, the enzymes, or bodies like enzymes, being liberated by the interaction of the organisms and the cellular defenses of the part. Now all enzymes have optimum critical temperatures of action, and if this optimum is increased beyond its threshold of maximum efficiency, the enzyme action is diminished at somewhat higher temperatures and the enzyme action is completely destroyed. The practical import of this obvious fact consists in the clinical admonition that in chronic traumatic osteomyelitis, gentle diathermy treatment applied for comparatively brief intervals will assist the forces of repair and union, but intensive treatment for long periods of time at each application will destroy the natural forces of repair.

We have just observed a reason for insisting upon short exposures to gentle diathermy intensity. We have next to discuss a second factor of importance. It has to do with where the heat is applied. Heat, superficially administered, as in the case of so-called phototherapy, infrared and the like, does not and cannot act in a fashion similar to diathermy. There is some value in superficial heating, it is said, due to the congestion which it brings on. Such congestion must obviously be decidedly superficial. Of course hyperemia is instrumental in the cure of the infectious syndrome. What we most desire, however, is primarily a congestion in the blood supply of the infected area in the bone, not a congestion of the surrounding soft tissues. In fact, if it is true that the superficial

hyperemia of a part is created somewhat at the expense of the blood supply of deeper structures, the principle upon which counterirritation depends for its success, then any form of superficial heating might be harmful to the cause rather than helpful. The harm would come in proportion as the superficial congestion created a corresponding anemia of the bone area involved. Diathermy obviously can generate a heating to produce congestion where congestion is most desired—in the periosteum and in the bone.

However, diathermy can be so applied as to defeat the purpose for which it is intended. In chronic suppurative traumatic osteomyelitis a double cuff method of diathermy application is of no more value than phototherapy. Let us see a laboratory explanation which supports the clinically observed ineffectiveness of double cuff technique in applying diathermy. Imagine a tube containing an albuminous fluid, say diluted white of raw egg. Imagine further two rings so immersed at opposite ends of the container as to simulate the double cuff method of application. When diathermy was passed through such an arrangement coagulation was seen to begin around each ring and to extend like a skin towards the midpoint of the surface, where finally the coats met. By means of this experiment it is easy to demonstrate that double cuffs produce what should be anticipated—a heating merely along the surface. Suitable variations of the experiment, amplified by thermocouple registration of the heat in various levels of the medium, corroborate what is generally well recognized among scientific users of diathermy—that the double cuff method is by far the most limited method of furnishing diathermy, at least in the conditions under discussion.

My observations, summarized to this point, bring out two important rules in the application of diathermy to chronic traumatic osteomyelitis. (1) Gentle diathermy applications ap-

parently increase and intensify the processes, undoubtedly chemical, responsible for repair and union. (2) Superficial heating, which includes diathermy wrongly applied, as by the ineffective double cuff method, and various forms of light, may be a contraindication and may even be conducive to arrest of union and repair.

With these two major facts in mind, two groups of cases were selected for treatment. Against these groups adequate controls were treated in the usual manner by the method of Carrel-Dakinization and hot dressings. There were selected for experiment cases diagnosed as (1) chronic osteoperiostitis, and as (2) traumatic osteomyelitis. In summary, it was observed that diathermy effected certain changes from the very institution of the treatment. These changes were, in the order in which they appeared, (a) prompt relief of pain and discomfort, associated with correction of the soft part pathology—relief of spasm, restoration of circulation, etc.; (b) the immediate relief persisted, according to the hospital records, over twenty-four hours after each treatment; (c) swelling, edema, and tumefaction disappeared; (d) the glistening skin with more or less trophic changes assumed a normal appearance; (e) where discharging sinuses were present the discharge at first increased, but it progressively changed from a purulent to a serous fluid and finally ceased entirely; (f) function was usually restored and the wound closed.

The method of treatment was essentially alike for all cases excepting for the size and location of electrodes, which was naturally determined by the anatomical location of the pathology. The guiding principle was to furnish, wherever possible, through and through diathermy, not double cuff. The treatments were given every twenty-four hours excepting in outpatient cases, where expediency permitted only three treatments a week. Short twenty-minute treatments with a current density of sixty milliamperes per square inch of active

electrode surface (the measure is taken from the smaller of the two electrodes, if their size is unequal) were furnished. If a sinus actively discharging was present, it was first packed with gauze saturated with normal saline and the electrode applied gently, but in contact, over the plugged opening. As an example of the adaptation of technique for osteomyelitis of specific anatomical location, it is possible to mention the treatment of the lower jaw with diathermy. A method which I found satisfactory consisted in placing the patient on what is called an auto-condensation cushion. The patient may either recline or sit. The active electrode is then easily adjusted on the skin overlying the infected part. To assist in obtaining good coaptation, angularities and depressions may be filled with sterile cotton moistened just short of dripping wet with normal saline solution. Such patients as have been treated with diathermy for chronic traumatic osteomyelitis of the inferior mandible progressed in most striking fashion, superseding, I feel sure, the results obtained usually when dealing with similar infections of the long bones. In the mandible cases the maximum number of treatments required for complete restoration in many instances under our supervision thus far was fifteen. The treatments were administered over a period of thirty days. In general, and particularly in cases of the flat bones, our results seemed more prompt and more brilliant than the corresponding controls treated by the usual Dakinization.

SUMMARY

1. In selected cases of chronic osteoperiostitis and chronic traumatic osteomyelitis furnished clinical recoveries in advance of similar control cases treated by Dakinization and hot compresses.

2. Diathermy must be applied (a) in sub-intensive doses; (b) in short twenty minute treatments; (c) preferable every twenty-four

hours; (d) by the through and through method; (e) not by the double cuff method.

3. The generalization of Van t' Hoff, applied to enzyme action, seems operative in this treatment.

DISCUSSION

DR. A. BERN HIRSCH: My own experience with diathermy in osteomyelitis is limited to the material that we handled in the war hospitals. Especially do I want to refer to the large array of osteomyelitis in bones of the extremities that we handled at Fox Hills Hospital, Staten Island, New York Harbor, over a period of nine months. It is unnecessary to go into detail for what I have to say corroborates the technic Dr. Kobak has just given us. I want to emphasize in a most emphatic way what he has told you about placing the electrodes opposite each other and avoiding the cuff method. We cannot make that too strong for there is a great deal of incorrect so-called diathermy being done by that method and it is the result of the teaching of one or two men who had large experience, but who set out their technique according to a set formula that was not based on thorough laboratory analysis, I am sure. Let us remember that. Your electrodes should be opposite each other. Otherwise you get your current from edge to edge of the electrodes.

In brief I may refer to an interesting paper on this subject which appeared in *Surgery, Gynecology and Obstetrics* for January, 1921. I had a dozen reproductions of the sky screens we had made in the few cases I there reported in considerable detail.

DR. RICHARD KOVACS: I would like to say in addition to what Dr. Hirsch has said that we must be very careful with a method like diathermy to apply it correctly. I want to add that the information spread by one man, who might be a very brilliant man in physics, but he has gone over the country lecturing. His book has been broadcast and he brought a number of things into common use that are being discredited by any man who tries to apply these things in a scientific way.

There is another false method called "stimulative" diathermy. You read in the same book of a technic with nothing said about results except that they are good. Nothing has ever been said about results. Patients have been subjected to a torment of treatment because the technic of this so-called "stimulative" diathermy is shot off with a current one-third of the

full amount usually employed, with the spark gap wide open and at the end of the treatment it is opened fully and the explanation given that it stirs up the tissue. If it is given for a minute the patient will complain very bitterly and the clinical effect is nil. We tried it out at the Reconstruction Hospital, and last year Dr. Stewart reported the same observation for sluggish healing of fractures, that he had no result whatever.

After using diathermy by the method described by Dr. Kobak for twenty or twenty-five minutes, we get a much better result than with so-called "stimulative" and other methods. I want to add this to what Dr. Hirsch has said and when we want to get together we must start to do a housecleaning from within and set things right. Dr. Kobak has done a great thing for us here by presenting a paper on this subject in such a convincing and remarkable manner.

DR. WILLIAM BENHAM SNOW: I want to refer to the treatment of a particular case. We have under observation a young woman about fourteen years of age who came to us with a sinus in the groin, about two inches beneath the trochanter. X rays showed a dilation of the canal with considerable bone involvement which was probably of tubercular origin. What I want to speak of is the way we applied diathermy. I fully agree with what Dr. Kobak has said of the cuff method. We do not employ it at all, but in the treatment of a case of the knee joint or the femur I like to have the knee flexed. Where I want to treat a femur I place the other electrode on the hip so that the course of current is through the whole length of the femur. We treated this patient constitutionally as well as for the local trouble. We gave her the arc light on the body and the mercury vapor lamp also in order to improve the constitutional conditions. Then we gave diathermy with one electrode over the knee and the other over the hip.

This young lady was attending high school and had no disability in the joint except a small amount of spasm which caused a bending of the knee. In less than a week that knee straightened and she has taken her treatments three times weekly. After about six weeks the lower sinus healed. In about two months the upper sinus disappeared completely. Those sinuses have all healed. There is still a bony condition. X rays show that the condition is not yet cured, but I think the result obtained by the use of the electrode back of the hip with the patient sitting up and the other on the anterior aspect of the knee is very effective in those cases and also in cases of extensive osteomyelitis.

With the leg, put the limb in a bath and carry the heat all the way up. We so accomplish things that would have been absolutely impossible by any other method.

DR. JOHN HUNTER: I would like to ask what the effect is on nutrition and the increase in weight during the treatment of these conditions.

DR. ELLIOTT TARBELL: I enjoyed this paper very much. It was very inclusive and very accurate. We use practically the same technic. Instead of using it once in twenty-four hours we sometimes use it twice during that time.

As Dr. Snow has said, sometimes in treating the femur we have one at the hip and the knee and in the tibia one at the knee. We use it with the knee flexed.

DR. W. T. LINDSAY: I would like to ask Dr. Kobak if he has compared the result of treatment between the arc light or radiant light and diathermy. We have been given a comparison between diathermy and the baking lamp. I wonder if he compared radiant light or arc light with diathermy.

DR. CHARLES F. STOKES: In my hands these methods have been extremely satisfactory in the treatment of this very troublesome lesion. I think it is well to keep before us the contrast between the older methods. Those of us who have chiselled out the shafts of bone, the femur and the humerus for instance, will be amazed at the rapidity with which these things healed when treated in this conservative manner. My practice has been much the same as Dr. Kobak's, but I use ultra violet radiations of long length and also the diminutive doses of x rays and supplement nutrition and any other method that lends to the well being of the patient.

DR. DISRAELI KOBAK (closing): Indeed I feel extremely gratified that the paper was so acceptable to the majority of the members. I was rather diffident and timorous in presenting this paper which was based on original work. I have found that the only way I can accomplish something worth while in physical therapy was to be my own pathfinder. I found very frequently that the mistakes of the text books were so evident after you began treating patients by the suggested methods, that I have kept away from these methods and have tried out, not original methods, but they were original with me. So I feel very gratified that the paper was so well received.

I appreciate Dr. Hirsch's and Dr. Kovacs' very kind remarks confirming some of my own opinions with this work.

I hold with Dr. Snow as to the electrode technic. One must utilize the physics of diathermy to the patient. One cannot become mechanical. One must vary the technic in the effort to relieve the patient of his affection.

While my theme was diathermy in osteomyelitis of certain selected types, I feel that a very fine word could have been said of ultra violet radiations in connection with these conditions. The bone pathology in osteomyelitis is osteoporosis, osteosclerosis, and we know that the real ultra violet is a specific in these conditions because it increases the metabolism of calcium in the blood and deposits in the bone. While I have omitted that in my paper, I am not unappreciative of its value in these conditions. I would use the long wave lengths for its oxydizing and calcium stimulating properties, and use the short wave lengths, or the far ultra violet, to promote bacterial sterilization and to increase local granulation. If one should utilize ultra violet, I should say be very careful in the method of stimulating granulation. One can destroy granulation with ultra violet as well as stimulate it.

The question of Dr. Hunter was a very good one. In the child, tonic ultra violet, as an adjuvant to the other treatment, effectively increases the weight of the child. If the weight rises, I believe the nutrition must be also increased.

As to Dr. Lindsay's question, I think the paper fairly covered the difference between radiant light in its effect on tissues. Where you want depth penetration. I think you will agree with me that the penetration of diathermy is greater than radiant light.

As to the arc light, the effect of radiant light from a tungsten bulb differs widely from the carbon arc lamp. In the first infra red and luminous energy is smaller, while in the latter there is an additional emission of short and long wave length ultra violet, according as to whether the carbon is impregnated with certain metal salts or not. It would be an interesting study to compare the relative effects of diathermy and carbon arc therapy on osteomyelitis. I regret that I have not included this energy in my comparative studies.



THE THERAPEUTIC VALUES OF EXERCISE*

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The values of exercise as a therapeutic agent are not, as a rule, sufficiently stressed by the medical profession. Since the muscles form so large a part of the human organism, it is apparent that by their use all of the tissues and organs, as well as body metabolism, are profoundly influenced. Exercises of speed, exercises of endurance, slow exercises, those forms which we term "light" or "heavy," all have their varying physiological effects. In addition, the patient himself must always be considered; what would be sufficient exercise for one, might be too much or too little for another. In order, therefore, to prescribe exercise intelligently, we must appreciate the different effects of the kinds of exercise, as mentioned above, and the immediate results of work imposed on the different muscle groups. Therefore, it is not sufficient for the physician to advise his patient to "take some exercise." Certainly he would not say "take some medicine," but would indicate the kind, the dosage, and the frequency of its administration.

Activity means life, vigor, efficiency, and happiness; inactivity produces decay, degeneration, stasis, weakness. The more active we are physically within physiological limits, the stronger we become; the more active mentally, the more vigorous we become mentally. But we must always remember that *rest* is just as essential as exercise. These diametrically opposed changes are the law of nature—such are periods of heat and cold, light and darkness, labor and rest, storm and calm, hunger and satisfaction, and the like. So muscular exercise at its best consists of alternate periods of

contraction and relaxation. The prolonged contraction of a muscle (the deltoid for example, in holding the arm in abduction for long periods) we call *static* contraction; this is not a desirable form of exercise because it requires steady innervation and hinders the circulation of blood and lymph; hence undesirable results are produced.

All exercise should be well within the capacity of the performer. Violent and straining exercises are never advisable. One should never push himself to the limit of his muscular ability. Health and efficiency depend largely on the condition of the neuromuscular system—the "master tissues," as physiologists call them. Muscles must be consciously cultivated; their study and the prescription of exercise come clearly under the domain of physical therapeutics.

For our consideration in this brief period we will divide the muscles into *fundamental* and *accessory*. The fundamental muscles are those of the legs, back, abdomen, and shoulders, which man possesses in common with the lower animals. These are the first to develop and the last to degenerate. Their movements are few, mostly rythmical and alternating. Much of the cortex of the brain consists of centers which govern the activity of these muscles. Their development is essential; in childhood, it is preeminently necessary that free opportunity for the use of these big muscles be allowed. Upon their development depends our stamina and that which we call a "constitution." The use of these muscles produces profound physiological results.

The accessory muscles are the smaller groups found in the forearms, fingers, the face,

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and the muscles of speech. They require delicate and diverse co-ordinations. They may be trained to extreme skill, as in writing, drawing, the playing of musical instruments, singing, varied forms of speech, and in thousands of precise and accurate manual manipulations. Their use requires much nervous control and they produce but slight effect on the important functions of the body, such as respiration, circulation, and digestion. The training of these muscles should not be overstressed in early childhood. At this age the fundamental groups should be given abundant use. Indeed the brain itself can never be developed to its full extent unless there is free and adequate use of this muscular group. Thus physical education is the cardinal and fundamental form of all educational processes.

The much used formula of the evolutionist, "function makes structure," holds good in all growth and development. If we are to produce an effect on the structure of an organism, we must make use of exercises that tend to bring about the desired change or perfection of structure. The parts of the body must be given that form of exercise for which the parts are best adapted. If the myocardium, for example, has become weakened without organic defect, gradually progressive exercises will build up the heart muscle to meet the increased circulatory demands. Weakened and unused muscles on the back of a growing child may be the primary cause of scoliosis. Appropriate exercises for the muscle groups concerned in maintaining posture will correct the beginning spinal curvature.

We must remember that "upon the germ plasm is written the law of the development of the individual." There are therefore varying types of individuals. No amount of training could develop the heavy draught horse into a race horse, or vice versa. In athletic exercises especially we must pick our types for the work required. The man who excels in weight throw-

ing is of different type from the lighter and more slender sprinter or hurdler. There should be no effort to develop every individual into a common mould. We must recognize types, and prescribe our exercise accordingly.

The contraction of a muscle involves three things—the motor center, the nerve current, and the muscle fibre. Brain, nerve, and muscle must function in healthy co-ordination. Contraction involves an expenditure of energy. This means combustion with the attendant products of combustion, which cause muscle stiffness and soreness from unusual or excessive work. The muscle cell absorbs carbohydrates and oxygen from the circulating blood; hence there results increased growth and strength. The centres governing circulation in the medulla are stimulated by exercise; hence increased cardiac activity. The muscle cell eliminates the products of combustion (carbon dioxide and urea); hence there is increased elimination. A greater consumption of proteids and carbohydrates causes a greater hunger for food, thus, the digestive tract comes into an increased state of activity.

Again, heat is evolved by rapid combustion in muscles; the superficial arteries and capillaries are dilated, surface radiation is increased, the sweat glands become more active. Thus we find that by means of muscular exercise all of the important physiological processes are affected—the respiration, circulation, digestion, excretion, and cell metabolism.

Forms of Exercise. Those exercises which are pleasurable are always most beneficial. One should enjoy an exercise, if best results are to be secured, because of the intimate connection between mental and physical processes. Exercise in company with an agreeable companion is always advisable. The drudgery of the work of farm chores, for example, does not at all fill the demand for exercise which is felt by the country boy. He needs his games and

his periods of free play, which have a stimulating and refreshing effect entirely different from the exercise entailed in the sawing of wood.

Fatigue is in proportion to the attention required in the performance of the exercise. Hence those movements which are more or less automatic in character produce good results with a minimum of mental and nervous strain. Walking may be cited as an example of a splendid type of exercise for the business or professional man, and indeed for almost anybody else. Walking with an object in view, as in the game of golf, with an additional action required of arms and shoulders, is a splendid type of exercise; but even this may be overdone, if infrequently and excessively practiced.

The kind of exercise necessary during the life of the individual must be related to his changing characteristics during those years. The exercises of childhood are unsuitable for adult life, and vice versa. Movements that are racially old include the best types of exercise. Under this category may be included walking, running, striking, throwing, hunting, fishing, and agricultural pursuits. Primitive man developed himself physically as well as mentally by means of the movements required in these forms of work. The fighting instinct likewise contributed to his physical development. In our modern civilization we thus make use wisely of such exercises as boxing, wrestling, fencing, tennis, and many other forms of athletics. Primitive man's exercise was always in the open air and sunshine; and from this we may surely learn a lesson. There was daily regularity to the muscular work of our ancestors. In this respect we are likely to fall short. A prominent physiologist recently remarked to the writer that he believed that "we are all in a state of chronic toxemia from lack of exercise."

In the prescription of exercise the pathology must be understood before we can intelligently direct our patients. The patient's own sensa-

tions and reaction to work must also give us a clue as to how much or how little he can stand. In infantile paralysis, for example, there is danger of overtaxing a weakened muscle. For this reason galvanic and faradic stimulation must be used, if used at all, with utmost caution. Active exercises are preferable to the contractile currents. If there is a spark of life in the affected muscles, it must be fanned into a flame by means of the stimulation which the patient himself may be able to send to his own muscles through his own nerves. Massage of course is helpful, because it is a kind of passive exercise. Assistive or resistive exercises, sling suspension movements, all serve to restore tonus and muscle sense, so necessary in any form of paralysis.

In digestive disorders and constipation exercise plays an important role. Bending and twisting movements and exercise of mild concussion and vibration, such as is afforded by walking, slow jogging, horseback riding, etc., all are valuable forms of exercise. They increase peristalsis and digestive activity.

It must be borne in mind that there are not only indications, but contraindications to exercise. The contraindications are the presence of acute inflammatory disorders, structural cardiac disease, duodenal or gastric ulcers, and tubercular infections generally.

Overnutrition and underoxidation are the common causes of obesity. A recent writer has said that there are two principal causes of the obese condition, digestive and endocrine. The former, he says, "can be described by only two adjectives—contemptible and disgusting. There are several types of endocrine obesity, but there is only one kind of alimentary obesity and the adjectives above describe it. Obesity is admittedly the most consistent confederate of all the deadly diseases, both microbic and metabolic, as well as the most uncompromising enemy of recovery from accident and injury. A fat man has not grown fat in a single night;

he has achieved his rotundity by a steady activity of his masseter muscles, sustained with grim determination over a long period of time."

The endocrine variety of obesity is a medical problem and, while exercise is an important adjuvant in the treatment, it is not in itself sufficient for the reduction of overweight. Nearly all forms of abdominal ptosis may be corrected or improved by vigorous and regular exercises of the groups of abdominal muscles. "Girth control" is an important consideration!

Senile prostates are favored by the sedentary life. Early fibrosis may be prevented in large measure by active exercises, especially walking. To prevent arteriosclerosis and other senile conditions exercise is a valuable form of treatment. We may actually break down old cells, replace them with new and more vigorous ones, and thus really renew our youth by means of judicious exercise. Mild exercises have a beneficial effect on hypertension without discoverable pathology.

We are reminded of the fact that the demand for exercise decreases with each year of life, but there is no age at which exercise to some degree is not necessary. The automobile has robbed us alarmingly of our legitimate exercise. In fact, there was never an age in which there was less demand for muscular work than today. Hence it is imperative that we give the matter conscious thought, not only in reference to our patients, but to ourselves, likewise. So let us carry on. Exercise promotes a clear brain, the joy of living, efficiency, zest, and gives us a well oiled body machine, so necessary in the game of life. When the Lord said "Man shall live by the sweat of his brow," it was not a curse, but a benediction!

DISCUSSION

DR. CURRAN POPE: One point regarding the cardiac lesion. All of you know of the interesting illus-

trations of Shott Brothers; you know of the marvelous work done by Ertell in the work he laid out for the gradual exercise of the cardiac patient. Everyone of you has splendid exercise prepared for you all the time in the shape of a pair of steps. It is not original with me. I think it was in London where I saw it many years ago. One can start out with a cardiac case and very gradually train them with the steps. Always start with the first walking sideways a step at a time. If you will try it you will be surprised how much easier it is to go up stairs sideways than it is to go up frontwards. If you will then teach the patient to go up steps frontwards, flat-footed instead of on the ball of the foot, gradually changing from the lateral ascent to the frontal ascent of the steps, and from the flat-footed to the ball of the foot, you can absolutely grade the exercise to almost any point you want.

DR. A. BERN HIRSCH: At the Walter Reed Hospital in the army days we had a relatively large number of both officers and privates brought in with functional cardiac illness. I won't go into the details of symptoms, but the ordinary drug methods failed for these people. They were morose, they were depressed, and other physical treatment methods were of no avail. We did not feel encouraged to try them. We put these people flat on their backs. One room was used for this particular class of cases. These people lay on their backs and a Miss Jackson put them through courses of exercise. Humming a low musical tune, she would walk up one aisle and down the other through these rows of men and she would go through certain exercises very slowly, each one distinct, and the patient would follow. It was most interesting to see the way a high pulse would come down, how the breathing would improve, the dyspnoea would disappear, and how the face would brighten up. It was an object lesson for us all at that time and it is one that is not nearly enough resorted to. It is one that is easy to teach, easy to carry out and it should be resorted to very much more than it is.

I want to ask Dr. Elson just two questions. One is, what has been your experience in inducing the profession in the northwest to add physical methods, massage included, to their curriculum? What has been your inducement to have them pick up these methods? In New York the doctor is just as obtuse to what we are trying to bring about in having him take up these exercises as in a great many other parts of the country.

The other question is, are you enabled to teach the undergraduates in the medical school there year after year these methods? I am interested particularly in this question because as chairman of the Com-

mittee on Instruction in Physical Therapeutic Methods both for undergraduates, postgraduates and non-medical technicians it has been rather difficult to obtain information on the subject.

DR. JOHN HUNTER: I would like to ask every member of this Association to broadcast your address as widely as possible. In my fifty years of experience I have never heard an address better worth broadcasting than yours.

DR. F. W. EWERHARDT (St. Louis, Mo.): I was given the great honor to discuss this paper, which I will not do because it has been well discussed. It is too much of a paper to discuss in two minutes. I am so interested in therapeutic exercise that I will not allow myself to say all I could say, but could not say in two minutes.

I would like to answer the two questions asked. One, the challenge to the West. I also am from the West and will answer it. It is a great day. I had charge of the department in a large hospital and we would not think of treating paralysis, heart cases, infantile or any kind of paralysis, fractures, arthritis, cases of convalescence, so-called below par cases, all those cases, without exercise.

For the last twelve years I have been giving lectures on therapeutic exercise to our medical students at the Washington University.

I want to compliment Dr. Elson on the fact that he was able to get exercise on the program. It is sort of a stepchild and to my mind it should be treated second to none, I do not know what I would do without my therapeutic exercise.

DR. MARY L. H. ARNOLD SNOW: Dr. Elson's most interesting paper abounds in food for thought. I recall that the importance of exercise in the treatment of chronic neuritis, as a supplement to electrotherapeutic measures, whether we use diathermy, radiant light and heat followed by diathermy, diathermy alone, or radiant light and heat followed by the diathermy or followed by the static current.

Another important disease to which exercise is of great value is that of locomotor ataxia. We do not use the Frankel exercises. We use graded exercises to develop the use and co-ordination of the parts in question, and our success or failure in exercise work depends on the technic employed and the selection of exercise to the particular case in question. and too much stress cannot be laid upon this important part in respect to exercise.

DR. HARRY EATON STEWART: It is certainly a pleasure to hear a paper on this subject. I think I

have given about six in the last nine years in this Association and to be backed up by a few live physical education men from the great open spaces is a joy.

Perhaps an exception might be taken to organic heart disease as a contraindication. That has been the natural conservative reaction, but some studies made in New York that have been quoted several times, made by Ballenbar, Almsey and Lee, proved that school children with organic heart disease had a remarkable tolerance for exercise. If we have a muscular organ working against organic disability, is not it the more important to keep that organ at its maximum of tone and efficiency? I think exercise within that heart's tolerance is a very important point.

DR. RICHARD KOVACS: We have in the American Electrotherapeutic Association a Committee on Therapeutic Exercise for the past six years, and Dr. Stewart was always complaining that he had practically no food from the members or from the Association, and Dr. Elson's paper has brought the importance of the subject before us and we hope that hereafter we will have more active interest in this subject.

The results are best shown that the committee report of our present committee on Therapeutic Exercise will deal with a paper on the dangers of commercialized exercise. Our new chairman, Dr. C. Ward Crampton, finds that because physicians neglect to give exercises, these physical therapists, so-called experts, do all sorts of damage. Our knowledge of this subject should be included with our curriculum. If you will come to the September meeting you will find we will try to cover the subject very thoroughly.

I want to make one comment regarding infantile paralysis. His emphasis on active exercise might be misunderstood. Sending an active impulse from the brain down to the muscles is very distressing. It cannot be carried out very well with children because it means intensive pain and besides sending impulses to a muscle that cannot respond is perhaps not the most efficient means. While we give the therapeutic exercises we must not forget the very important electrotherapeutic means, our sinusoidal currents, by bringing them up to a point where they can respond to voluntary exercise and especially in young children.

I want to thank Dr. Elson again, and another interesting thing is at the end of an afternoon's session the paper took up an hour and that shows how much it has been appreciated.

DR. J. C. ELSON (Closing): This has been an extremely gratifying discussion. I did not mean to give the impression that exercise is altogether contraindicated.

cated even in organic heart lesions. What I intended to say was in certain organic heart lesions, but in the very limited time I did not specify that,

As to the interest the medical profession is taking in the therapeutic value of exercise, I am afraid we find the interest of the physician in the West like in the East, and it is rather difficult to stimulate their enthusiasm as we would like to.

However, in answer to another question, we give the medical students at the University of Wisconsin instruction in the principles of physical therapy, and in that course I stress the value of exercise so that every medical student knows something about the fundamental principles of physical therapy. Whether he practices physical therapy or not he should know at least something about it.

Regarding infantile paralysis, I want to admonish Dr. Kovacs that while massage is not exactly passive exercise, it produces somewhat the same effect. It is stimulation to the circulation and it has a heating effect.

Regarding the application of the currents in infantile paralysis, we must be very, very careful. We must remember we have a very poor, diseased, weakened muscle and under treatment we can leave the muscle in a very much worse condition than at first. We must remember that our dosage must be very gradually and carefully increased. Regarding the exercises for infantile paralysis, of course I had in mind the administration of these exercises by a technician who would see that the child does the exercises. I want to remind you again that this is physical therapy.

SURGICAL INDICATIONS FOR ELECTROTHERMIC METHODS*

WILLIAM L. CLARK, M. D.

PHILADELPHIA

The nature of malignant diseases, and the wide variation in the characteristics of different neoplasms is such that we can not at the present time hope to treat all cases alike. One who would aim to secure the best results, must have a wide knowledge of all useful methods, and must study each individual case very closely in order to determine the line of treatment best suited to the individual tumor. The use of radium, x ray and surgery in malignant disease has been very fully covered by many authorities, and it is our purpose in the present paper to consider these cases in which the Electrothermic Method possesses superior advantages.

The microscopical study of pathological specimens has shown in a very clear manner the wide differences in tumors, which clinically ap-

pear to be the same. It has been found that the cells in some tumors are embryonic in character, showing little, if any attempt at differentiation. Tumors in this class are readily susceptible to radiation and may be properly selected for this form of treatment. From this stage, where the cells are embryonic, we have tumors showing varying degrees of differentiation, until we reach a type where a very large percentage of the cells have approached almost to the adult type. Tumors of this class are not readily influenced by radiation, because they are just as resistant as the normal tissue, and the treatment would have to be so prolonged that great damage would result to the normal cells in the immediate vicinity. This class of neoplasm is the one in which the Electrothermic Methods are indicated. By this Method, we can totally destroy all the diseased cells without producing any injurious effect upon the adjacent tissue; furthermore, it eradicates the tumor at once, leaving it to separate as a dead mass, and the surrounding normal tissue being unaffected, nature brings about a prompt healing with no contracted scar, and less chance of recurrence.

*Delivered before the American College of Physical Therapy, Chicago, Ill., October 20, 1926.

This paper has been prepared from stenographic notes of an impromptu talk by Dr. W. H. Schmidt, representing Dr. Clark, and illustrated with lantern slides showing examples of these conditions. The remarks have been re-arranged and elaborated. No attempt has been made to consider the subject exhaustively.

It has been found there are two distinct effects produced by the Electrothermic Methods, as applied to living tissue. Tissue which has been treated by the desiccation method, which is a mild form of heat developed in the tissue by the high frequency current, sufficient to destroy the cells by evaporating all the moisture in the cells, and causing a rupture of cell membrane, has been found to produce a characteristic picture when studied under the microscope. The cells were shrunken and shriveled, and their nuclei condensed and elongated, with a suggestion of cell outline. The blood vessels were thrombosed and there was no evidence of hemorrhage. The second effect is produced by the coagulating current, which may be either a very strong monopolar current, or as a general rule, the bipolar current. The effect produced here, as shown microscopically after treatment, presents quite a different picture. The cell outlines are entirely lost, the tissue elements fused into a shriveled homogeneous mass, presenting an appearance not unlike that of hyalinization.

Microscopic examination of sections of the normal tissue, surrounding an area treated by the Electrothermic Method, showed in the outlying zones a marked round-cell infiltration, which in some instances, is localized around the blood vessels. This is similar to the normal body reaction to the growth of a neoplasm, and it would seem that the Electrothermic Methods possess the ability to call into play the natural defenses of the body to these tumors.

The Electrothermic Methods possess advantages in benign lesions as well as in the malignant lesions, and briefly, we will consider these conditions first.

Ordinary moles are quite common on the face and other parts of the body, and should be removed, not only for their cosmetic effects, but also because they frequently degenerate into malignant lesions. This is particularly true if

in a position to be irritated. A local anesthetic, employing a 2% solution of novocain is used in the procedure, and with a mild desiccating current, they can be destroyed, leaving no evidence of a scar after healing. If the lesion shows some changes suggestive of beginning malignancy, the treatment should extend somewhat deeper, and be more thorough. The pigmented moles are more dangerous, particularly, if the pigment is very black, and should receive more thorough and careful treatment.

Warts are also common lesions, and should be removed for the same reason as moles. They very frequently occur in unusual positions, such as under the nails, or on the sole of the foot, and in these locations require careful attention in order to destroy the entire growth. The technique is the same as is used in removing moles.

Keloids are mentioned, simply to point out that the Electrothermic Methods can not be used in these conditions, as they will recur just as readily after this treatment, as after surgical removal. Radium, however, can be used successfully in keloids.

Tattoo marks can be removed by a mild desiccating current with very excellent results. The technique is rather exacting. In some cases, the pigmentation is very deep in the skin, and again in others very superficial; and the technique varies according to the condition found at the time of the operation, but with careful work, they can be completely removed, leaving no scar.

Rhinophyma is a condition for which we have had no adequate treatment in the past. By the use of the Electrothermic Methods, we are able to be of considerable help to these patients. In some instances, where the lesion is more or less localized, it can be entirely removed by means of the desiccation current. In other instances, where the entire nose is involved, a great amount of good can be accomplished by

inserting the needle into the depths of the tissue, making a small area of destruction which is effective in sterilizing the tissue, and the contraction, following healing will go a long ways to reduce the size of the nose.

Angiomas of the congenital type, which are not too extensive, are ideally treated by the Electrothermic Method. They can be removed totally and promptly without the loss of blood, and with very little scarring. The character of the current used depends upon the size of the lesion. In those lesions about the size of a quarter, a mild desiccating current is sufficient. The technique must be exact. The needle is applied to the center of the angioma, great care being taken not to allow the needle to puncture the angioma, as this would cause bleeding, and greatly complicate the operation. After the current has been applied to the center, it will shrink up and become dry; we then apply the needle more closely, and in a circular manner gradually work towards the edges, driving the blood out of the angioma, as we proceed. After the elevated portion has been destroyed, we must again apply the current rather thoroughly to the base. In order to destroy the blood lake, which is always present under the lesion. The method is not of use in the treatment of port-wine marks, but in the elevated angiomas, the Electrothermic Methods are far superior to the use of radium or surgery. These angiomas have been destroyed on the face, body, eyelids, tongue, lips, and various other locations with perfect results.

Telangiectasis following x ray treatment can be markedly improved at times with the desiccating current. Where the vessel is large and easily outlined, the momentary application of a mild desiccating current to the base will entirely obliterate it. By going over a lesion in this way, and treating the prominent vessels, marked improvement in the lesion results.

CANCER OF THE SKIN

Careful attention to precancerous lesions on the skin will prevent the development of cancer,

and it should be possible to eliminate almost 100% of these lesions. Practically, every malignant lesion on the skin is preceded by some form of chronic irritation, which is perfectly apparent and exists for a considerable period of time before malignant degeneration occurs. Among those lesions may be mentioned; senile keratosis, irritated warts, moles, fissures, simple tubercular and syphilitic ulcers, all of which are amenable to treatment by the Electrothermic Method with probably 100% success.

Cancer of the skin is usually basal-cell in type and simply requires destruction of all malignant cells to totally eradicate the disease. In the early cases which are more or less superficial, the desiccating current should be used, followed by curettage, and a re-application to the base. It does not make any difference how large the lesion may be, if the current is applied thoroughly and carefully, we should be able to clear up practically all those cases. The technique for large tumors is the same; after thorough destruction, the lesion is curetted, and a reapplication of the current made to the base. These growths seldom metastasize to the glands, and if properly done should heal without evidence of malignant disease, and remain well permanently. The scar is soft and flexible, and there is no contracture. This good cosmetic result is very desirable on the face.

CANCER AROUND THE EYE

Epithelioma of the eyelids is quite a common condition. Either the upper or the lower lid may be involved, and quite frequently, the lesion involves the inner and outer canthus. The Electrothermic Method is a great advantage in the treatment of these conditions. The healthy tissue can be conserved, and only the microscopically diseased tissue destroyed. We depend upon the heat which penetrates in large amounts well beyond the area actually destroyed to devitalize the cancer cells, which may have extended a short distance from the lesion. The cartilage may be conserved, and healing takes place

with practically a regeneration of normal tissue. There is no scar formation and no contracture of the lids. This avoids the danger of exposing the eye-ball, and consequent loss of the eye.

Occasionally, these lesions are neglected, and the disease spreads and involves both the upper and lower eyelids, totally destroying them, and occasionally, it involves the orbit itself. Where this occurs, it becomes necessary to remove the eyeball, as the protection of the lids having been lost, the eyeball promptly would become useless. At times, the disease spreads and involves the tissue of the nose, cheek and forehead. Even these extensive lesions are usually basal-cell in type, and if all of the diseased tissue is removed, they will heal up. After the destruction and removal of the lids, the eyeball is enucleated. This may be done surgically, or if the disease involves the tissue of the orbit, it is better to employ the Electrothermic Method, and coagulate the entire tissue of the orbit before removing the eyeball. Indeed, it is possible to entirely exenterate the orbit, even stripping the periosteum from the bone, and have the condition heal frequently without recurrence of the disease.

We, occasionally, see lesions of a malignant nature involving the cornea, either epithelioma or sarcoma. In several instances, it has been possible to destroy and remove these lesions on the cornea without doing any damage to the eyeball, and without opening the anterior chamber. Of course, this requires a careful technique, and very great care in the application.

CANCER OF THE LIP

Epithelioma of the lower lip lends itself very readily to treatment by the Electrothermic Method. In this location, epithelioma occurs in two forms: The first type is rather superficial, and presents itself as a papillomatous outgrowth with very little infiltration. This form is not so apt to invade the glands, and if seen

reasonably early, practically 100% of these cases can be cleared up. The other type partakes of the nature of an ulceration with infiltration of the surrounding tissue, and early involvement of the glands. This type is much more malignant, and the results are correspondingly not so good. The treatment is carried out under a local anesthesia, which is secured by circumscribing the growth, never plunging the needle into the diseased tissue. The current is then regulated according to the size of the growth to be destroyed, and a line of destruction is made by the current around the growth, after which the entire lesion is thoroughly destroyed. This does not lend itself readily to curettage, and as a rule, we employ curved scissors to remove the desiccated tissue, cutting through the coagulated area. A re-application of the current is then made to the base. In the infiltrating types, the technique is practically the same, but care must be taken to use a current of sufficient strength and penetration to go well beyond the diseased area.

In all cases of cancer of the lip, careful consideration must be given to the glands of the neck, as success or failure depends entirely upon the results obtained in the treatment of the glands. If the glands are not enlarged, external radium treatment, or x ray will usually serve to hold them in check. If the glands are already enlarged, external radiation is not sufficient, and in this event, we employ radium needles which are buried in the glands, and allowed to remain for a varying period of time. The surgical removal of glands in these cases is still a debatable matter. The glands are nature's filters, and serve to check the progress of the disease. If they are already involved, it is a question whether surgical interference is of value in tissue which is already infected with malignant disease. However, if it is the surgeon's desire to remove them surgically, it should only be attempted after a thorough radiation treatment. Another point, frequently overlooked is, that it is equally as important to apply the radiation to the tissue be-

tween the lesion and the glands of the neck so as to destroy any migrating cells in the lymphatic ducts.

CANCER OF THE ORAL CAVITY

Malignant disease in the oral cavity lends itself readily to this form of treatment. Surgical interference is usually difficult, and in many instances, the lesion is so far advanced that the surgeon usually considers it inoperable. The type of growth occurring in this location is very malignant, and metastasizes to the glands early. The cells of the tumor are usually well differentiated and little affected by radiation, either x ray or radium. The skillful use of the Electrothermic Method will produce better results than anything else, and will also give the formerly inoperable cases a chance which they have not had in the past. As a rule, these lesions in the mouth are all treated under a general anesthesia. Ether is employed and must be removed from the room before the spark is used. The bipolar current is the one of choice, as we require a deep penetration and thorough destruction. If the bone is involved, it can be destroyed just as readily as the tissues.

CANCER OF THE TONGUE

In cancer of the tongue, it is possible to destroy a small lesion with almost uniformly good results. If the disease is extensive, and involves the whole tongue, a total amputation can be done with little difficulty. The operation has the advantage that it requires very little time; there is no loss of blood, little surgical shock, and there is usually immediate relief from pain. Following the operation, there is considerable swelling and difficulty in swallowing; but, considering the seriousness of the operation, the after-discomforts are insignificant. If the operation is extensive, it may be advisable to ligate the carotid artery on one or both sides, in order to prevent possible secondary hemorrhage. Patients in poor physical condition, should also have a

gastrostomy done in order to build up and improve nutrition, and also serve as a means of feeding the patient during the subsequent healing process. In this way, we can maintain the patient's nourishment properly, which is of prime importance in these cases.

CANCER OF THE LOWER JAW

In lesions involving the lower jaw, if an x ray examination shows only the upper margin of the bone to be diseased it is possible to destroy the diseased portion, and preserve the healthy bone, which will conserve the natural contour of the jaw and prevent deformity. Bone destroyed in this way will sequestrate in about six weeks.

It is not saying too much that in malignant disease in the oral cavity, the Electrothermic Methods have been the greatest advance in the treatment of cancer. Here again, it must be stated, that success or failure depends upon the treatment of the glandular involvement in all these cases of malignant disease in the oral cavity.

CANCER OF THE SINUSES

Malignant disease of the sinuses is more or less common. It may originate as a primary lesion in the vicinity. The frontal sinus is usually involved as an extension of a growth in the orbit, or on the forehead. With a careful technique, the frontal sinus may be entered and the disease destroyed, such bone as is diseased or destroyed by the current is removed by proper bone instruments, or allowed to sequestrate. The posterior wall must be treated with great care, as only a thin layer of bone protects the brain in this location.

Malignant disease primary in the nasal cavity and involving the ethmoids and antrum, or beginning primarily in the antrum, must be treated after surgical exposure. The incision is made along the lower margin of the orbit, fol-

lowing down the side of the nose to the center of the upper lip. This flap is turned back, exposing the bone and giving free access to the nasal cavity and the antrum. The current is then employed, and all the diseased area thoroughly devitalized, including the bone. The soft tissue is then curetted away, and the bone removed by rangers, exposing the depths fully. The current is then re-applied carefully to every suspicious area, after which the cavity is packed.

Where the antrum is involved secondarily, the approach depends upon the location of the primary lesion. If the original lesion is in the orbit, the antrum can be entered through the floor of the orbit and completely and thoroughly treated. If the primary lesion is on the face, the antrum is entered directly from the front. When the original lesion is in the upper jaw, it is thoroughly destroyed with the current first, and then removed with a suitable instrument, after which the current is applied to the antrum, and its contents thoroughly coagulated. By means of a large curette, it is then thoroughly cleansed, and a re-application of the current made, and then carefully packed.

This technique permits of thorough treatment without the loss of much blood and little shock. We believe the chances of success are much greater with this treatment, and heretofore inoperable cases are given a chance, which previously was denied them.

CANCER OF THE BREAST

The surgical operation for cancer of the breast apparently gives the best results in the early cases, and if the surgeon considers the case operable, that form of treatment should be employed. There are many precancerous lesions of the breast which can be ideally treated by the Electrothermic Methods. Among these are—irritated moles and warts, cracks and ulceration around the nipples and Paget's Disease in the

early stage. No opportunity should be lost to prevent the development of this serious disease.

Occasionally, we encounter an advanced case neglected, or purposely concealed, which is inoperable. A large mass may be present, or extensive ulceration producing marked pain, discharge and bleeding. Frequently, the glands show little or no involvement. Such cases can be thoroughly coagulated, and removed as a dead mass with marked benefit. The pain, discharge and bleeding disappear, and the patient gains in health and strength, and the breast heals over. Of course a cure can not be expected, and the patient invariably dies from some internal metastasis, but as a rule, they are given two or three years of comfortable life, and succumb in a more merciful and painless manner.

Local recurrence in the sight of the scar and recurrent nodules on the chest-wall can be successfully treated by the Electrothermic Method. These conditions should be treated as quickly as they are discovered.

CANCER OF THE EXTERNAL GENITALIA

Carcinoma involving the labia and clitoris is best treated by the Electrothermic Method. The treatment should be thorough, going well beyond the diseased area, and removing every vestige of malignant tissue. This region is rich in lymphatics, and shows an early tendency to involve the inguinal glands, so that appropriate treatment must be directed to these glands. The results in this location have been very gratifying.

CANCER OF THE UTERUS

No better form of treatment is available for cancer of the uterus than radium, and with few exceptions, it is always employed. In the past, we have employed the Electrothermic Method as a palliative to destroy large masses of cancer of the uterus, checking the discharge and stopping bleeding. As a rule, this tissue is not sensi-

tive, and no anesthetic is necessary, and the erosion can be thoroughly destroyed with a mild current, producing a healthy granulating surface, which quickly heals over.

Papilloma and erosions of the cervix, also chronic endocervicitis, can be best treated by the electrothermic method.

CANCER OF THE BLADDER

In carcinoma of the bladder, it is always advisable to do an operation, and not attempt to destroy the growth through a cystoscope. A suprapubic cystotomy will expose the growth, after which it can be destroyed by means of the Electrothermic Method. Occasionally, in these cases, it is advisable to use radium in some form, as the additional aid in the treatment.

Experience in the use of the Electrothermic Method has brought about many changes in the technique. The importance of a careful study of the patient as to his general physical condition, and means of building it up and maintaining general nutrition, together with examination of the malignant tissue, to determine the nature of the growth, and the degree of differentiation of the cells, is very important; likewise, care should be taken to prevent the occurrence of a secondary hemorrhage, which is always an unfortunate occurrence in these cases. All demand careful consideration in every case. When these factors are duly considered, and the patient's physical condition, the results in the employment of the Electrothermic Method will be correspondingly improved, and eventually, it will attain the place in the treatment of malignant disease, which it truly deserves.

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INTENSIVE METHODS OF APPLYING HEAT FOR RELIEF OF PAIN AND OTHER THERAPEUTIC EFFECTS*

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The use of heat as a means of relieving pain is one of the oldest therapeutic measures. Even suffering animals seem to be guided by instinct to resort to this simple physical agent when suffering pain. A dog suffering from earache puts his warm paw against his ear. A baby with earache places its hand to its ear. A person suffering with abdominal pain involuntarily bends his body forward and draws his thighs upward. Primitive people of all countries from the Arctics to the South Sea Islands treat rheumatism by hot vapor or steam baths administered in various ingenious ways. The Finlander shuts himself in a small room and

creates steam by pouring water on hot stones. The Maoris of New Zealand heat stones in a pit and cover them with palm leaves on which the patient lies down, and a mat is covered over all.

Just how heat relieves pain is perhaps not fully understood. It probably acts in several ways, sometimes by diverting blood from congested parts through the production of a collateral hyperemia, and sometimes, perhaps, by accelerating blood movement and so relieving a vascular stasis. But almost magical effects in relieving pain are often produced by hot applications under conditions in which neither of these explanations seems adequate to account for the results obtained. In some way not

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clearly explicable heat lessens nerve sensibility and abolishes pain. It has been suggested that this thermic effect is the result of inhibition acting through the temperature nerves of the skin. Whatever may be the explanation, we know that heat, properly applied, kills pain. This remarkable quality seems to be one of the specific properties of heat, which it always possesses, no matter what its origin. Heat waves of all lengths produce pain relieving effects, but the luminous heat waves and the shorter infra red rays found in the upper region of the infra red section of the spectrum appear to be the most effective, doubtless because of their greater penetrating power.

It is not my intention to devote space in this article to the description of apparatus, but I think it worth while to call attention to the fact that special apparatus for the application of infra red rays is not needed, for the reason that these rays are always present in abundant quantity. Long infra red rays are available in any quantity desired through such commonly employed means of making heat applications as the fomentation, the hot poultice, hot water bag, hot sand bags, heated stones or bricks, etc, and the shorter and more penetrating infra red and luminous heat rays are always present in the radiation from arc and incandescent lamps of every sort. Even the glowing coals of an open fireplace are a most efficient source of heat rays of the very highest therapeutic value.

The one point which it is the purpose of this paper to impress is the fact that for efficient and definite effects a certain and rather high degree of intensity is required.

The specific effect of heat upon nerve sensibility is shown in its effect upon the tactile sense. Beginning with 113° F., tactile sensibility is steadily diminished as the temperature rises until at 130° F. it disappears entirely, the application at this point becoming painful.

Every person who has had any considerable experience in the use of heat for relief of pain has learned by observation that for decided effects the applications must be very hot, as hot as the patient is able to bear. Applications of lower temperature may give some relief and afford the patient considerable comfort, but to conquer the pain the application must be hot enough to produce on first contact with the skin a slightly painful sensation. In applying a fomentation a well trained attendant makes the fomentation cloth so hot that it is necessary to lift it from the skin for a few seconds almost immediately after the application is made, or to pass the hand underneath, next the skin so as to admit air and permit slight cooling of the surface by evaporation. After the compress has cooled a little, so that the heat becomes easily tolerable, it is usually left in place for four or five minutes and then renewed two or three times. The chief benefit which a patient derives from such an application is due to the intense heat effect experienced for the first half minute or minute at the beginning of each application. Thus the total duration of the effective part of the application may not be more than two or three minutes, although the time occupied by the whole treatment may have been fifteen minutes or more. Attendants should be instructed in the application of the fomentation to make the changes rapidly, at least once a minute, continuing for fifteen or twenty minutes. As the skin becomes more tolerant to heat, the temperature of the compress should be gradually increased, until the maximum temperature which the skin will tolerate is reached. I have often seen very severe and obstinate pains relieved when this intensive method was employed even when hot compresses applied in the usual way had proved entirely ineffective.

There are various other effective methods of applying water intensively. One of the most useful of these is the intensive hot hand bath. A suitable vessel, which may be an ordinary lavatory, is filled with water having a tempera-

ture of not less than 120° F. At this temperature the hands cannot be held in the water for any great length of time, but they may be rapidly dipped in a number of times. At first it may not be possible to hold the hands in the water for more than one or two seconds before withdrawing. After allowing the surface to cool in the air while rubbing the hands for two or three seconds, dip in the water again, and so continue alternately dipping and cooling until the desired effect is obtained. Twenty-five or thirty dips will usually suffice to relieve the misery of painful rheumatic finger joints. Tenderness of the joints will also be lessened. A good plan is to have the patient count at the rate of two counts to the second. Beginning when the hands are placed in the water, count 1, 2, 3, 4, 5. The water should be so hot that it will be impossible to keep the hands longer immersed. After lifting from the water, count five, then dip again, and so continue. As the hands become a little more accustomed to the heat the number of counts with hands in the water may be increased to ten or even more, but the time out of the water need not be increased.

Patients suffering from rheumatic finger joints may with great profit employ the intensive hand bath three or four times a day. Care should be taken to avoid chilling the hands by exposure to cold air after a hot bath. If the hands become cold they should, as soon as possible, be given a hot bath, after which vaseline or cold cream should be applied and the fingers should be protected by warm gloves or other efficient means.

The intensive hot foot bath is equally valuable for rheumatic feet. The temperature of the foot bath at the beginning should be about 105° F. The temperature should be rapidly raised to about 110° F., and after a minute or two, more hot water should be added, so as to raise the temperature to 115° F. The feet

should be repeatedly placed in the water and lifted out with counting, as already above described for the intensive hand bath.

The intensive hot foot bath is an excellent means of relieving pelvic pain as well as pains in the feet. The use of the hot foot bath for relief of dysmenorrhea is a common practice of the laity of many parts of the country. Applied by the intensive method, the efficiency of the foot bath will be found greatly increased. For nearly forty years I have made use of the hot foot bath as a means of relieving pain after abdominal operations involving the pelvic viscera, and with such good effects that in hundreds of cases of this class I found it unnecessary to employ anodynes of any sort, either immediately after the operation or at any time during the postoperative care of the patient. Patients suffer so much less from constipation, loss of appetite, nervousness, intestinal gas, and other miseries common to surgical cases of this sort that I feel fully justified in urging more frequent use of the hot foot bath and other means of applying heat in the postoperative care of surgical cases, instead of the hypodermic injections of morphia and other anodyne medication now commonly employed. The late Dr. Lawson Tait of Birmingham, England, with whom I spent a few months very profitably as a student assistant nearly forty years ago, never gave his patients any sort of pain relieving medicine. He said to me one day: "I never give drugs of any sort to relieve pain unless I am sure the patient is going to die." Dr. Tait attributed his unusual success in abdominal operations (he had a record of one hundred and sixteen successive abdominal operations without a death) very largely to the fact that he withheld anodynes and encouraged intestinal activity both before and after operating. His patients often suffered greatly and sometimes made quite a bedlam of his wards with their screams and groans, and it was this experience which suggested to me the use of the hot foot

bath and other hot applications in this class of cases. The comfort afforded the patient proved to be so valuable a factor in connection with other allied measures that I was able to improve even Dr. Tait's record, quite unusual for that time which was prior to the introduction of rubber gloves by extending the list of successive laparotomy recoveries to one hundred and sixty-five.

Another intensive method of applying heat which I have found most useful in a very distressing class of patients, is the hot lave bath. This bath is adapted to the relief of superficial sensory disturbances, especially the intolerable itching of urticaria and the burning and itching of eczema and other irritable skin disorders. The method consists in laving the affected parts with very hot water. Care must be taken not to pour the water upon the skin in a continuous stream, as the temperature which must be employed is so great that, if poured upon the skin, a severe burn will be produced. The temperature of the water should be 120° to 130° F. Even hotter water may be employed, if great care is exercised. The best method of making the application is to extend the affected part, say a hand or an arm, over the edge of a bath tub partly filled with water of the proper temperature. With a basin the water is dipped and projected in such a way that it spreads out in a thin layer and descends upon the affected surface by the force of gravity. When applied in this way the water, no matter what its temperature, retains its heat for so short a time that the skin is not burned, although a very intense sense of heat is produced. When deftly managed, this method of applying heat is wonderfully effective in relieving most intolerable itching and burning, no matter how severe or what the cause. Applications may be made to the back by allowing the patient to sit over the edge of the tub. Parts which cannot be reached in this way may be treated by means of napkins dipped in hot water and applied to

the skin by brief touchings, care being taken not to maintain the contact long enough to produce blistering. The effect of a thermic application of this sort is so certain and prompt as to seem almost magical, and the relief afforded usually continues for several hours. With proper care to protect the skin after applications of this sort with suitable emollients, the applications usually prove to be not only palliative, but curative.

In general the most convenient and efficient means of applying heat therapeutically, either general or local, is the incandescent filament. Heat rays from such a source have a remarkable penetrating power. It was the discovery of this fact in 1891 that led me to the construction of the photophore for local use and the electric light bath cabinet for general applications of heat. The discovery was quite accidental. In turning on a sidelight one evening my hand while close to the lamp came between my eye and the filament, and I noticed a red glow through the fingers, which suggested to me at once that the incandescent light was a new and superior means of applying heat to the body because of its penetrating power. I at once constructed various forms of photophores, consisting of one or more incandescent lamps mounted with a metallic reflector, and shortly after had constructed various types of cabinets in which thirty to fifty incandescent lights were employed. In one type of cabinet the source of heat was four arc lights, one in each corner.

I soon discovered that the overheating of the surface was something of an obstacle in the way of the highest degree of efficiency, for the reason that it prevented the use of a sufficient amount of heat to influence strongly the deeper tissues. I endeavored to overcome this difficulty in various ways. One plan was the combination of a shower bath with the electric light bath. Such a combination permitted the

use of a much larger volume of heat than can be employed in the ordinary cabinet. In the use of the thermophore for local applications of heat it was found easily possible to greatly increase the intensity of the application by keeping the surface moist by passing over it a cloth or a sponge saturated with cool or tepid water at frequent intervals. The evaporation thus promoted kept the superficial layers of the skin cool without obstructing the more penetrating heat rays. I soon discovered that the same effects could be produced by directing upon the heated surface a current of air, and have employed this method ever since.

The intensity of a hot application may be greatly increased by combining with it some means of simultaneously cooling the skin surface. This method requires the use of some suitable source of heat radiation. Either an arc light, the incandescent lamp, or a heating element may be used. A small electric fan will supply the air current. With a current of air falling upon the heated surface the intensity of the light application may be doubled. This means that the tissues beneath the skin surface are receiving twice as large quantities of radiant energy as they could receive without the protective cooling of the skin surface. By this means quantities of heat may be applied which would be absolutely intolerant to the skin and would produce structural injury if long continued, and this without the slightest injury to the skin tissues or the slightest interference with the passage of the penetrating heat rays to the deeper structures.

From the facts already stated it must be evident that cooling of the skin surface during an application of radiant heat is a matter of great practical importance. This is clearly shown by clinical experience. Cases in which no relief is obtained by ordinary hot applications readily yield to the massive doses of radiant energy which become permissible by

this method. By moistening the surface from time to time, so as to maintain evaporation in connection with the air current, the surface may be so efficiently cooled that the doses may be still further increased to three or four times the amount tolerable without the surface cooling. This method is especially applicable to cases of deep seated neuralgia, such as chronic sciatica and in cases of deep seated visceral pain.

INTERMITTENT HOT APPLICATIONS

When revulsive effects are indicated the object desired may be readily attained by a slight modification of the method just described. By the use of a swinging electric fan the air current, instead of being continuous, will be interrupted at regular intervals. The light should be placed at such a distance from the skin that during the interruption of the air current the temperature will rise to the point of greatest tolerance. When the swing of the fan again causes the current to play upon the heated surface, cooling will occur, to be followed by a quick rise as soon as the swing of the fan carries it out of range. The periods of heating and cooling may be doubled by placing the fan at right angles with the light and in such a position that when the side facing the patient is swung to the extreme limit the air current will still be felt. When this is done the patient receives the current while the fan is both going and coming, or for the time required for one complete swing.

Another method of producing intermittent heating effects is by turning the current on and off at such intervals as may be desired. The switch controlling the current may be placed in the hands of the patient, who will regulate the duration of the application by counting. The heat should be so great that it can be tolerated only for a time not greater than that required for counting ten at a moderately rapid rate, say two counts to the second. Perhaps at first the point of tolerance may be reached at

the end of five counts. When the switch is turned off the patient counts ten while the skin is cooling, then turns the current on and repeats the counting. Instead of turning the current off and on by hand a mechanical or automatic interrupter may be employed. All of these different methods I have employed, but find on the whole nothing better than the combination of the ordinary thermophore, such as the Battle Creek junior deep therapy lamp combined with the ordinary simple electric fan.

The suggestions offered in this brief paper may seem to be so simple that they are hardly worth considering, but I am sure that any practical clinician, who will make a trial of the intensive methods described as means of relieving pain, will find them so efficient that he will soon be making use of morphia and other anodyne drugs very much less frequently than was previously thought necessary. And I think most of my medical colleagues will agree that anything which tends directly or indirectly to lessen the use of these powerful narcotic drugs, to which patients so quickly become habituated and enslaved, is worthy of serious consideration and a fair test in practical experience.

DISCUSSION

DR. WILLIAM BENHAM SNOW: I think this is one of the most interesting papers of the session. No one knows better than Dr. Kellogg the subject of this paper. In 1909 I published a work on "Radiant Light and Heat and Convective Heat." My object in making that term "convective heat" was instigated by the fact that a few years previous to the time a paper had been published where attention had been called to the fact that applications of heat by hot water bags and things of that sort only produced adequate heat to produce a hyperemia in the skin and carried away all of the heat so that the process received none. That was done with a cat. Heat was applied to the skin at temperatures just short of burning and while the application was made there was no change in the temperature beneath the skin. In other words, the hyperemia induced in the skin was adequate to carry away all the heat. This made the use of hot applications impractical where you wanted heat effects. Convective

heat was the heat carried away by the vessels in the hyperemic area, so preventing the deep effect of heat in the underlying tissues.

A year later Dr. Kellogg's work came out. It is a little book. Mine was loaned and never returned which I regret very much.

The paper we heard this morning conveys the same idea, showing that radiant light and heat in its effects are so efficient in overcoming the conditions of pain in the deeper structures. I do not think Doctor emphasized that as much in the paper as I might have, but that is what really occurred. As the doctor observed, the penetration of heat in his finger caused the observation that radiations went in. We put a lamp in our mouth and see what happens. The radiations come through the skin. If the luminous rays are considerable, the infra red are more considerable, and we get a penetration of twenty to thirty millimeters of heat. So the effect of heat is produced in that way.

The methods Dr. Kellogg prescribed of using more intense applications of heat are interesting because it shows by interruptions of application we are enabled to use a temperature that could not be employed otherwise. Another method we have is to pass the hand over. Take the two hands with the patient under a canopy light and have the patient rub the hands over.

The time of application is a very important thing. In using radiant light and heat on a process where pus is present it should be kept up at least an hour. In otitis media I make the applications always for an hour. It heats the thick cells. The thick cells become heated by the long application and as the cells are heated the hyperemia persists. The consequence is that you get a very much prolonged effect of hyperemia by the long application, and it is just what we want to do in an infection because we want the hyperemia to persist as long as it can in order to get as much as possible the phagocytic effect on the infection. This is a very important point and I cannot be too insistent in urging the long application of heat.

Regarding the relation of pain, you have an old case of neuritis and the relief lasts only for an hour or two because you do not get rid of the stasis. The hyperemia produced by radiant light and heat or diathermy does not remove stasis. In a sprained ankle heat relieves it, but how much is it relieved, or a synovitis of a knee joint. There we must intervene with something else. There we can use our static current. There is nothing in the world that will get rid of the stasis as the static current. Light is limited in its re-

lief. The relative effects of light as a therapeutic measure are only to be considered in the relief of pain.

DR. A. BERN HIRSCH: I am very glad this subject has been brought up again for our attention. It is time someone had refreshed us and freshened our memories with the value of moist heat. It is one that has its distinct place in our armamentarium and that you do not want to forget. When we hear gentlemen speak of its being supplanted by other mechanical or electrical means, we lose sight of the fact that there are certain classes of cases, surgical if you will, that demand other treatment than entirely diathermy or radiant light and heat to obtain good effects. To initiate treatment by electrical means I refer to the whirlpool bath. We have here some of the men who wore the uniform during the war and who were in charge at extensive physiotherapy clinics in the war hospitals, and they will affirm what I have to say I am sure that thousands of the cases that came there to be treated, who came back from the war zone with injuries of all kinds, parallel to the industrial injuries of today, would never have gotten anywhere if we had not been able to initiate the electrical applications by the whirlpool bath. Winternitz of Vienna first placed treatment by water on a scientific basis, and the late Professor Barrach of Columbia University was the father of that movement on this side. Just before he died he gave a course of lectures and discussions at the Polyclinic Hospital in New York City to a group of us. There he showed certain electrical methods of treatment that he acknowledged would take the place of much of what had been previously accomplished by heat, hot water and water applications, but there still was a place, he insisted, for water applications, especially in painful conditions that could not be taken by any other means in our command.

I offer for your consideration the advisability of obtaining his last work, "The Epitomy of Hydrotherapy," that came out about six or eight years ago. You will find it will have its value many a time in daily practice.

DR. JOHN HUNTER: A recent physiologist told us that every nerve filament in the human body is insulated from origin to insertion; that is that the nerve responds to pain. These are insulated up to the terminal. For a short distance there is a raw surface. Pain is produced by pressure on this raw surface. The moment we can relieve the pressure and stasis we relieve our pain.

DR. W. T. LINDSEY: I have been a peculiar combination of physical therapist and surgeon for a number of years back and want to second the words of the essayist in suggesting the use of the hot foot bath

in postoperative abdominal conditions involving the pelvis and abdomen particularly.

I agree with what Dr. Snow and the gentleman back here has said, that in congestive conditions of the abdomen diathermy, even if it is postoperative, should take precedence over the hot foot bath. My conception is that following major abdominal operations the conditions of shock have interfered with the even distribution of blood. Two methods I have used for a long time have been the immediate injection into the bowel of at least a quart of ordinary tap water, sometimes with a little mineral oil added, and when the anaesthetic is worn off and they are in a condition of pain and distress, the hot foot bath gives a great deal of relief. If I have operated in the presence of acute infection, the immediate use of diathermy through the abdomen is the method par excellence. Too much emphasis cannot be laid on the use of heat measures in those cases that are due to the shock on the abdomen.

By a hot foot bath you draw a large quantity of blood, that would be in a condition of stasis in the abdomen by the shock. I inject a quart of water as soon as I can, in half an hour inject another quart so that at the end of an hour following the operation two quarts have been added to the lymphatic tissue of that patient's pelvic abdomen and if they have pain give them a hot foot bath unless there is an inflammatory infection present when I use diathermy.

DR. J. C. ELSOM: I should like to emphasize the good words of Dr. Hirsch when he recommended the use of the whirlpool bath. At the physical therapy departments of the army we made very extensive use of this method of application of heat, and we had large numbers of amputations and an immense amount of scar tissue. Scar tissue is extremely susceptible to applications of heat, and we must be careful not to produce blistering.

When you have your hand in a tub of warm water, if you keep your hand stationary the heat is not so perceptible, but if you wiggle your hand around the heat increases. That, is the theory of the whirlpool bath. There are the air bubbles which produce some massage effects. You can get your effect with a lower temperature than with a limb in stationary water. I also want to emphasize the effect on scar tissue, which is always so important, and concerning which we must be so careful.

DR. ELLIOTT TARBELL (Closing for Dr. John H. Kellogg): I am sorry Dr. Kellogg is not here to discuss this for you. I enjoyed Dr. Snow's discussion very much. He spoke of using the hands for relief-

ing heat. This idea of using the fan was suggested and using the long time of application Dr. Snow spoke of is what we like to use, but this just suggests to you a method by which you can make the thing automatic. If you had an arm in which you wanted to apply heat with an arc lamp or an incandescent bulb and you had a small electric fan swinging around, you would greatly increase your effect. It should be at a distance from your source of heat where a person could tolerate it without moving, about fifteen inches away. By using a fan in this way you can reduce it to about ten. You can use a little electric fan and greatly increase the heat. The same thing is true with the alpine light, the zoalite or the infra red radiations.

Dr. Lindsey spoke of using diathermy. I certainly agree that diathermy in the treatment is a very valu-

able aid. We make several hundred applications of diathermy every week at the Battle Creek Sanitarium.

I think the whirlpool bath works out fine. That is particularly applicable for use in treating a limb.

Our postoperative patients, most of them, get diathermy routinely. If it is an appendix operation we find that we can increase the healing process. We can cut down the time of convalescence, but instead of using hypnotics we use hot foot baths and things of that kind.

Dr. Kellogg did not try to be comprehensive. He just tried to bring up one little thing that might be of value to you, utilizing the apparatus you have, and might help to make it more efficient in relieving pain.

THE EFFECTS OF LOWER FREQUENCIES OF RADIANT ENERGY ON SOME FORMS OF GERM LIFE*

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A definite explanation of the *modus operandi* of certain uniform clinical results that are obtained from the administration of radiant light and heat in the treatment of some forms of infection is deserving of earnest research.

This subject has been one of recognized importance since Dr. Herbert F. Pitcher¹ announced the successful cure of otitis media and cases of mastoiditis with reflected incandescent light radiations. The results reported by him have been verified repeatedly by those who have adopted the method, but doubts have prevailed as to how the germs are destroyed.

As time has passed, the same results have been obtained with the treatment of infected conditions with different types of bacteria, notably of pneumonia in children, erysipelas, gonorrheal infections, sinusitis, cholecystitis,

coryzas and others. The clinical facts are well established, but certainty as to how the germs are destroyed is as yet more or less an open question.

The following differential actions are offered for consideration: (1) Is the degree of heat and light the skin will tolerate adequate to destroy the germs *in situ*; or (2) do the reflected light and heat radiations, by relaxing the tissues and stimulating the vasomotor reflexes, so determine a greater flux of blood with a sufficient number of leucocytes into the invaded tissues as to overwhelm the germs; or (3) are they destroyed by the twofold action of phagocytes present in the hyperemia induced by the radiations facilitated by the consequent natural impededness of the blood stream due to the capillary resistance under conditions that the tissues become so engorged by the great influx of blood under conditions that favor phagocytosis with diapedesis of leucocytes into the lymph spaces in numbers sufficient to destroy the bacteria.

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To determine what it is that causes the disappearance of the germs and so effects a cure of local infection is a problem, the solution of which will clarify and so make rational the understanding of the process by which the clinical results are obtained.

It had been often surmised from the removal of different types of local infection that the reflected and direct incandescent radiations had a specific light and heat effect capable, in superficial cases, of destroying the germs in situ. This was notably the conclusion in the first case of erysipelas so treated by me in 1910, when by a ninety-minute exposure to an early case with a dosage tempered to skin toleration, the infection was totally destroyed by the one exposure. This was positively confirmed in our offices by the following case treated by Dr. Mary Arnold Snow:²

"In that case—the second one treated—the edema of the face had closed both eyes. After four hours' exposure to intense radiation—two hours in the morning and two in the afternoon—the edema disappeared. Two additional exposures on the two following days restored the features to normal."

The following case reported by Dr. James R. Bingham,³ who had been informed of the result with the other cases reported, illustrates the result in the severer type of case:

"A patient with facial erysipelas had received no treatment for several days after its inception, and the disease was well advanced. One eye was entirely closed by the swelling, and the other nearly so. All the features of the face were practically obliterated, and one ear was very badly swollen and painful.

"I had light applied for an hour's duration, five or six times the first day, and twice during the first night as the patient was wakeful. During the second day the light was ap-

plied less often and for shorter periods, and as the patient slept all during the second night it was not applied at all.

"From the beginning the pain was markedly relieved by each treatment, and after the first day there was absolutely no pain complained of by the patient.

"The swelling and redness began to recede from the first application of the light, and at the end of forty-eight hours the only manifestation of the disease remaining was a slight swelling of the involved ear, which entirely disappeared on the third day after a few short applications of the light."

Since the accomplishment of these results the method has been frequently suggested to my students and confreres, and many cases have since been treated and have so confirmed the reliability of the method.⁴

It was assumed that in erysipelas the heat and light had overwhelmed the bacteria, locally, without special reference to the hyperemia resulting from the exposure with the increased number of leucocytes carried into the infected tissues, or that it was due to a combined action of the heat and the greater activity of an increased number of phagocytes. Recent experiments have been made which have shown that both streptococci and staphylococci exposed to cultures in Petri dishes will withstand exposures to temperatures of 130° F. for two hours and grow. This proves that the result obtained must be attributed to the activity of the phagocytes under conditions produced by the radiant light and heat.

Gonorrheal ophthalmia in the adult, as shown by the first case so treated by reflected light and heat⁵ in the person of a physician who was infected at the Hoboken Port of Embarkation, was cured as was a case of ophthalmia neonatorum⁶ treated by the physician who had

received the first treatment. Other cases^{7 8} have since been reported and it is fair to assume that the radiant light and heat was adequate to destroy the germs in situ in these cases because the gonococcus succumbs to temperatures that the patient can tolerate over the closed lid—approximately 105° to 107° F.

Later the germs have been uniformly destroyed by radiant light and heat and diathermy in cases of purulent ophthalmia not of gonorrheal origin.

In both types of ophthalmia an intense hyperemia is caused by the infection before the administration of the radiant energy, but in neither type of cases has it been adequate to destroy the infection without the administration of the light and heat to which it has promptly yielded, which obviously favors phagocytosis.

With diathermy there is prompt response to the effects of heat in local infections, notably cholecystitis, sinusitis and the early stage of appendicitis, all of which yield also to reflected radiant light and heat. The same question arises here as to whether the result is due to the increased hyperemia induced by the heat with an increase in the phagocytic defenses, or to the heat or a combination of both the heat and the increased phagocytosis.

Pneumococci yield to heat in vivo with prompt institution of lysis either with diathermy or in the thin chests of small children to reflected incandescent light and heat. Here, as in the previous conditions cited, the question is again presented, why are the germs destroyed or the germ processes arrested?

The number of cases of pneumonia reported in which the course was ended by lysis would seem to afford conclusive proof that the effects of either the current passing through the

pneumonic process evolves heat enough in the tissues to unfavorably affect the pneumococci. Either that or the current must otherwise affect to arrest the pneumonic process. That the lung tissue is more resisting than muscle, peculiarly so when aerated, is readily understood. The heat induced in pneumonia may be even greater than of the skin at the surface. Be this as it may, experience is confirmatory, as shown by Drs. Byron S. Price,⁹ Harry E. Stewart¹⁰ and Charles S. Stephenson¹¹ and myself from the summary of case reports, totaling one hundred and forty-three cases of pneumonia already reported in which one hundred and twenty-six recovered and seventeen died. With these cases lysis was instituted in sixty-six and in the other cases no report was made as to lysis or crisis. With these figures and the observations of others, there is no question whatever but that diathermy does promptly effect commencing resolution of the pneumonic process.

According to the findings reported in the following quotation¹² the effects of heat seem to be verified in all pneumonic cases:

"The records of Sternberg¹³ quoted by Hiss and Zinsser,¹⁴ show that a temperature as low as 105° F. will arrest the development of bacteria and that even lower temperatures inhibit their growth. Hiss and Zinsser¹⁵ state that 'the growth of pneumococci is most favorable at 99.5° F. and development ceases below 77° F., and above 106° F.' A. Frankel¹⁶ states, according to Hiss and Zinsser, that 'at room temperatures of from 60° to 72° F. the growth of pneumococcus ceases.' It will be seen, therefore, that the range of proliferation of the pneumococcus is between the temperatures of 72° and 106° F., and that at about body temperature development is most favorable."

It may be further stated, as evidence of its importance, that at the Brooklyn Naval Hospital cases of pneumonia, under the supervi-

sion of Lieutenant Commander Charles S. Stephenson, have all been treated by diathermy with such a measure of success that it is now the established method in that hospital. Commander Stephenson reported that out of sixty-four cases of all types treated fifty-seven made complete recovery. In his report no statement was made as to whether the termination had been by lysis or crisis.

The treatment of pneumonia by the use of antigens, while still contended for by its advocates, has proved far from successful during the past year. In one hospital in the early period of 1926-27 there had been ten deaths under this treatment. Our contention, therefore, is that for the future at least greater attention should be paid to treatment by diathermy or by reflected incandescent light. The reports of Torbett and Williams¹⁷ gave remarkable results from the use of reflected radiant light and heat in the epidemic of 1919. For success, these measures should be used at the outset, not at the time approaching crisis when the patient is far reduced and the case complicated with resulting cardiac weakness. If instituted at the stage of chill with the acute pains at the outset, before the respiratory murmurs have ceased, when, as pleurisies have been promptly cured by diathermy with few treatments pneumonias might reasonably be expected to be aborted at this stage.

The inadequacy of antigen treatment is such, even in the cases in which autogenous antigens are taken from the lesions present, that the adoption, or at least the thorough investigation as to the efficiency of physical measures, is deserving of consideration. The uniformity of satisfactory results established with light and heat methods in the experience of many observers familiar with physical therapy justifies due consideration by the medical profession.

To rest upon clinical evidence of so-called cures has been customary during the ages and

is still largely the reliance with chemotherapy, but is not recognized as adequate evidence and is not satisfactory when the newer, all but unbelievable accomplishments of physical therapy are under investigation. It should be the intent, therefore, of those who recognize the importance of establishing more than clinical evidence, to be able, when possible, to establish the *modus operandi* of the action of each of the physical modalities.

Some bacteria are recognized, as shown, to be susceptible to heat, notably the pneumococcus and the gonococcus, but most types of the staphylococci and streptococci grow well in temperatures of 40° C., exposures that are not tolerated by the skin either with diathermy, reflected radiant light and heat or infra red rays.

That some bacteria do not succumb to the administrations of these measures but are promptly eliminated, while not destroyed by the radiant energy *per se*, but by altering the conditions in the tissues that eventuate their destruction by the natural activities—the leucocytes and lymphocytes in circulation, is clinically demonstrated. That under these conditions no antigen effect is induced is beyond question. If temperatures that cannot be tolerated at the port of entry—the skin—are not adequate to destroy the germs, they are certainly inadequate to create antigens which would so further their destruction.

By exclusion then, the results are attributable, under the conditions created, alone to the activity of the phagocytes. As stated elsewhere, it is fair to assume that the method of action by either the microphages or the macrophages in the tissue is made more effective under the influence of the hyperemia induced by the production of heat in the tissues.

It is a matter beyond question or doubt that wherever heat is applied hyperemia is induced. The flux of blood through the tissues

becomes greater by the dilation of the vessels and physiologically under these conditions the blood stream is slowed up because as the blood fills in the vessels the capillary dilation is inadequate to permit the flow of the greater quantity of blood that is drawn to the tissues. Under the condition with slowing of the blood stream, the action of the leucocytes is favored, for then diapedesis is favored and the envelopment of the germs by the phagocytes takes place under more favorable conditions. This seems to be the explanation of the effects of light and heat with the induction of hyperemia and ultimate destruction of the bacterial process. So in erysipelas, otitis media, bronchitis, cholecystitis, sinusitis and many other conditions that are favorably conquered by the application of heat either of radiant energy from luminous sources, infra red rays or diathermy, the destruction of the bacterial processes must be attributed to conditions that favor phagocytosis.

There can be no question as to the efficacy of these measures in the conditions referred to, but the rapidity with which this is effected will vary in different subjects, for as Zinsser¹⁸ puts it, "the actual harm resulting from the infection must, to a large extent, depend upon the degree of adaptation to the new condition of life possible on the part of both the invader and the host." So the physical condition of an individual patient as to normality and the number and activity of the leucocytes in circulation must play a role in the determination in different cases subjected to any treatment by diathermy or radiant energy. In other words, the accomplishment, prompt or otherwise, must depend upon the opsonic index—the vitality of and the number of the leucocytes in the blood stream to overcome a given infection. So in a debilitated patient where the physical condition of the individual does not insure a normal activity of the phagocytes, the treatment would necessarily be prolonged or fail.

These observations based upon clinical results in the treatment of local infections are

such that at this time too great attention cannot be given to the adoption of or at least the investigation of the subject by all whose attention may be called to what has been accomplished.

CONCLUSIONS

1. The lower frequencies of radiant energy or of heat from any other source is effective in the destruction of some forms of germ life.
2. It is and has been problematical as to how heat acts in effecting the destruction of bacteria, whether by direct action destroying the germs in situ or through the influence of bacteria called into the field of infection by the hyperemia induced.
3. The effects of the various forms of heat energy in destroying the gonococci and its effects upon the germs of pneumonia seem to be due substantially to the effects of light and heat upon the germs with the probable additional increased local phagocytosis.
4. Strains of streptococci and staphylococci are heat and light resisting above temperatures that cannot be tolerated by the skin at the surface and consequently are not available for effecting the bacteria within.
5. The conclusion resolves itself into the greater facilities of the leucocytes in the blood stream which is slowed when the hyperemia is exerted by the capillary resistance, when with the increased flow of blood to the part a larger number of phagocytes are coincidentally brought into the field. The microphages and the macrophages are so rendered more active in effecting the destruction of local infection.
6. The physical condition of the host and the consequent relative activity of the leucocytes are factors that may render less certain the efficiency of the measures which induce the hyperemia.

7. Clinical evidence has established beyond question the therapeutic indications of radiant light and heat and diathermy in the treatment of local infection. These observations, while not demonstrating fully the *modus operandi* of the process are directed to an earnest investigation of the therapeutic effects the measures considered.

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DISCUSSION

DR. T. T. GIBSON (Middleburgh, Ky.): I would like to ask the doctor if he has ever used diathermy in typhoid as well as in pneumonia. I have used diathermy in a few cases of typhoid, but we have few cases. What few cases I have had have received almost as good results as those reported of pneumonia, but it takes a little more time.

PROFESSOR ALLBERT J. MATHEWS (Cincinnati, O.): I would like to ask if the doctor has any information regarding the action on the blood mechanism, if he has ever tried it on bleeders or anything of that sort. In these hemophiliacs, we have now three or four of them, I found that when we sensitized the individual to a protein and then injected, after sensitization, into the skin a second dose of protein, a skin reaction was produced. Just as soon as you get the reaction in the skin the clotting would come down to normal and the bleeding ceased. That has been confirmed in several cases. That relationship is a very curious thing and it occurred to me, in so much as there is a close relationship between blood clotting and defense against disease, there is hardly any doubt about there being a real connection, that probably the skin on stimulation by light or heat would effect the clotting mechanism as well as it seems to have developed the defensive mechanism of the body. I would like to ask if he has any information on that point to give us.

DR. A. BERN HIRSCH: This array of facts given us by Dr. Snow simply brings to mind again the remark of Professor Mathews when he uttered a plea for more original investigation on the part of American practitioners and scientists, and here would be just the opportunity presented.

In the report on the use of various rays of the spectrum, which of course includes the lower range, presented at the annual meeting of this association last year, reference was made to the large number of physicians who die each year from acute infection, punctured wounds, received while operating, a large number, and the number of those who are not physicians must be very much greater. Here is the opportunity now to do some of that original work and I make the plea that all who are here and have hospital or laboratory connections outside of hospitals should try to institute such a range of study along the line of what Dr. Snow has mentioned here. Let us have more original investigation.

I was impressed last year while in Denmark and some of those northern European countries that in the hospitals there it is the rule to have a department of original investigation, original study, and when cases are being treated, cases in which problems of obscure nature present themselves, immediately study is made by trained experts, and that is the lead we should follow in our own country, and if members of this association and those who are visiting our meeting and are interested will present the institution of such research laboratories in connection with the different hospitals, a great work will be done.

DR. M. A. COHEN (Boston, Mass.): I have always been interested in Dr. Snow's papers. We at the Reconstruction Clinic in Boston, where we take care of so many different conditions, meet the problem of infection very often every day. I remember back about three years ago—we have many different lines, especially in dealing with the ignorant man who will not follow instructions and would not know how if you told him—we had a great number of infections and finally we took those fellows and exposed them to radiant light for an hour or two and made them come back twice and sometimes three times a day, and it was surprising to see how we reduced the number of incisions and operations that had to be made.

I recall many cases because we have, in conjunction with the surgical department, some infections where they advised immediate opening. In those cases we would apply heat for an hour three times a day. Now we apply heat in every case of infection and get very good results.

DR. JOHN L. HUNTER: I would like to refer to one case of infection of the eye. This was done by what I call a "bull mosquito." They strike you with a great force. He was treated by one of our best specialists in Toronto. Treatment continued for six weeks. Three years ago he was again infected in the other eye in the same way. A year ago he was reinfected in the same way. This time he came to me and I used diathermy, a small electrode on the eye and another on the neck. Within a minute or two the pain was relieved. I treated that case with diathermy and he was not disabled for twenty-four hours. He returned a year ago in splendid condition and the trouble had not returned since he was treated with diathermy.

DR. CURRAN POPE: A patient came into my hospital a very short while ago and on the third day developed parotitis of the left side. He was treated with diathermy and with the radiant light and in three days you could not find any evidence of the involvement of the gland whatsoever.

DR. WILLIAM BENHAM SNOW (Closing): I want to thank the gentlemen for the discussion. I am interested in the use of diathermy in typhoid fever. Dr. Tice of Roanoke, Virginia, reported four or five cases ten or twelve years ago in which he used the x ray with about the same results Dr. Gibson had. We used to lower the temperature. Today we do not. The only risk in using diathermy is the hemorrhage. It would make you hesitate, but if you dare to use it before there is danger of causing hemorrhage from the ulcers it would be a good measure to try.

I want to emphasize the treatment of local septic infection by heat. If I have a bad case in which I have a line running to the axilla and pus present, the first thing I do is get the pus out and then bake. I do not call light "baking," but it is a temperature of 400° to 500° Fahrenheit, and keep it there for half an hour or a full hour, and I have never had a case that did not get well under that treatment. As long as the blood is circulating back and forth, such a temperature is adequate to get that blood heated. It is the ideal thing and I hope you are going to remember it and always employ it. If you have a real bad case the pus must be gotten out and then use the dry heat. You need never lose a case of local infection.

I cannot report any results in hemophilias, but I would like to give it a trial. A few years ago a lady physician in India had a static machine. She applied the wave current over the spleen in a case of hemophilia and the woman was cured. We use x rays on the spleen and liver in cases of fibroid tumors when the x ray over the uterus does not promptly check the hemorrhage.

THE VALUE OF LIPIODOL IN X RAY EXAMINATIONS OF THE LUNGS*

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The great advantage of tracing the bronchial tree by means of some contrast substance has been appreciated for a considerable period of time, but the technique has only recently been perfected. Chevalier Jackson (1) in 1907 introduced the method. He used for this purpose dry bismuth subcarbonate insufflated thru the bronchoscope. In 1918, W. H. Stewart (2) and the late Dr. Lynah demonstrated excellent radiographs of bronchial abscesses and bronchiectatic cavities which they had filled with an emulsion of bismuth in olive oil. In 1922 Sicard and Forestier (3) used lipiodol for injection of the bronchial tree. Lipiodol is a French preparation put out by Dr. Lafay of Paris, and is the oil of poppy seed containing 40% iodine by weight. The oil and the iodine are firmly bound together so that the solution does not give the usual starch test for iodine. There is sufficient of the iodine in the solution, however, to make the mixture clearly visible on the x ray plate and at the same time it is not irritating to the delicate bronchial mucosa.

Following the introduction of this method by Sicard and Forestier,—Forestier and Leroux (4), Sargent and Cottenot (5) repeated the method with gratifying results. They soon discovered that since the oil gravitated into the more dependent portions of the lung, by changing the position of the patient any desired portion of the lung could be mapped out. Delille (6) confined his work to children and detected many cases of bronchiectasis in children confined to a sanitarium under the mistaken diagnosis of tuberculosis.

*Read at fifth annual meeting, American College of Physical Therapy, Chicago, Oct. 22, 1926.

TECHNIQUE

The French preparation is called "Lipiodal". The German preparation is called "Iodipin". The Danish product is designated "Iodumbrin". (7) While more recently, Dyroff introduced a preparation called "Contrastol". This preparation has been devised to avoid any possible chance of iodism. This has been accomplished by substituting bromine in place of iodine. This preparation, unlike the iodized oils, can be readily sterilized by boiling.

Method of Introduction

Two methods of introduction are in general use. One where the introduction is made thru the larynx into the trachea and the other where the solution is introduced thru the cricothyroid membrane into the trachea. Where the laryngeal method is used the pharynx and the larynx must be thoroughly anesthetized by cocaine, following which a weak solution of cocaine is introduced into the trachea and bronchial tree. Following this anesthetization, several different methods have been used for introducing the oil. The French school prefers the use of a laryngeal syringe provided with a long canula. Others such as Clerf (9), 1925, and Ballon (10) injected the oil through a long canula inserted through a bronchoscope. Beck and Sgalitzer (11) of Vienna have employed a retention catheter which they introduce through the larynx and direct the flow of the oil by placing the patient in front of the fluoroscope while the oil is being injected. On the other hand, Haslinger (12) uses a specially devised bronchus tube which he guides into the bronchus by means of

fluoroscopic control. Still another method has been devised by Nather (13). His method is to thoroughly cocaineize the larynx and hypopharynx, after which the patient is instructed to swallow the oil. According to Nather in most instances when the patient attempts to swallow the oil it passes into the trachea. The bronchoscopic method is undoubtedly the most certain and offers the additional advantage of direct inspection and removal of specimens where indicated. When the bronchoscopic method is used the oil can be directed into the right or left bronchus as desired under direct vision. This method is naturally limited to those who are skilled in its use. The catheter method is simple but requires considerable cooperation on the part of the patient and is naturally not practical in children. The swallowing method is uncertain and runs the risk of iodism should the oil pass into the stomach and the risk of infection in the air passages where it passes into the trachea. The cough reflex is not abolished by this method so that it is difficult to get a good injection.

Iglauer (14) has devised a scheme for using a specially designed intubation tube which has

the additional passage way on one side through which the oil is injected, the main passage way allowing the air to pass as the patient breathes.

Injection of the oil through the cricothyroid membrane as introduced by Rosenthal is the route chosen by most general surgeons. When this route is to be used a specially designed curved hollow needle attached to a guard must be used. This is inserted through the cricothyroid membrane. After the air passages have been anesthetized with a weak solution of cocaine to obtund the cough reflex, the oil is then slowly injected, the patient being maintained in the position desired. Whatever method of injection is used, the operator must be careful to warm the oil to body temperature. Lipiodol Lafay comes to the user in a specially devised aluminum vacuum tube. This tube can be placed in a water bath bringing the oil to the proper temperature for use, after which it can be drawn into the 20 cc syringe which is used for injecting the oil into the air passages.

General Considerations

Iodized oil is of a clear amber color with a specific gravity of 1.350 and is insoluble in water

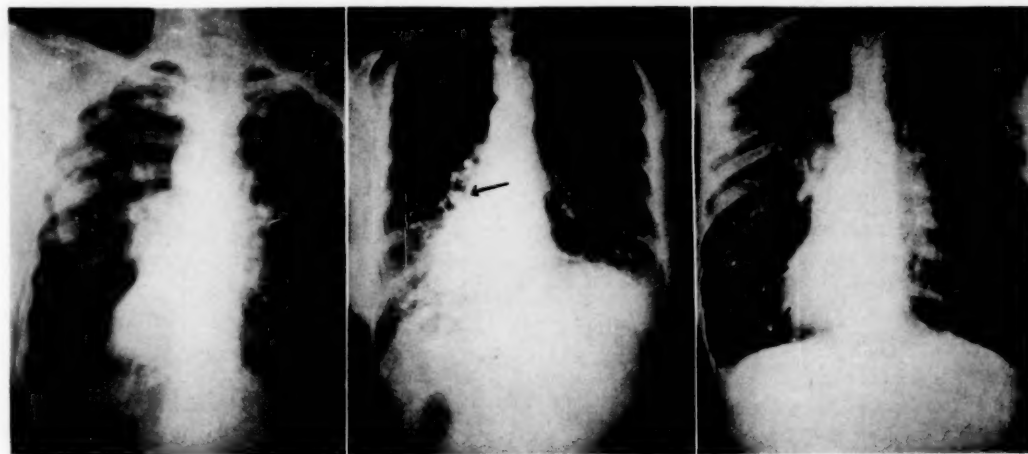


Fig. 1.—Roentgenogram of chest in whom a clinical diagnosis of bronchiectasis was made. Unable to detect cavities.

Fig. 2.—Same patient as Fig. 1. after injection of lipiodol through the cricothyroid membrane. Note

the filled cavities near the heart on left side.

Fig. 3.—Roentgenogram of patient eleven days after injection. Note small deposits of lipiodol still present.

or alcohol. The iodine may be liberated by the alkaline carbonates of the saliva (15) and intestinal secretions but is unchanged by the gastric acidity. Because of the liberation of iodine the oil becomes brown when exposed to light, air, humidity and high temperature. Because the free iodine is irritating to the bronchial mucosa the oil cannot be used when brown. In all cases, the use of discolored oil should be avoided. The oil should be brought to body temperature before use. The anesthetizing solutions should also be brought to body temperature. After injection of the oil, the roentgenograms should be made as expeditiously as possible and with the least possible disturbance of the patient.

Advantages of the Method

The injection of the iodized oil into the air passages renders the bronchi and communicating cavities definitely visible on the x ray films. Many cases suffering from bronchiectasis or from small tuberculous cavities in whom repeated x ray examinations have been made with the usual technique without definite localization of the cavities, are definitely cleared up by this method. Not only are the pathological bronchi definitely visible but the normal bronchi as well. Cavities

which communicate with the bronchus can usually be filled with the solution. Occasionally, however, cavities cannot be filled on account of the temporary closure of the stoma. This may be due to the presence of mucous or pus or even to the position of the cavity with relationship to its bronchial outlet. Naturally when the bronchus is occluded by a foreign body or stenosis it is impossible to fill that portion of the lung radiating outward from the occluded bronchus. It will be seen then that any distortion, obstruction or displacement of the trachea and bronchi are definitely visible. Bronchiectatic cavities or cavities of other types located in the posterior portion of the base of the lung can be clearly demonstrated by this method. Lung abscesses cannot always be injected by this method, due to the fact that a cavity may be filled with secretion or that the opening to the bronchus is very narrow. The use of iodized oil in tuberculous patients has been employed with great trepidation. Archibald and Ballon, however, undertook this method in a large number of tuberculous cases without any bad results. In fact, some have found that this method is valuable as a diagnostic help in patients who have been pronounced clinically tuberculous but in whom

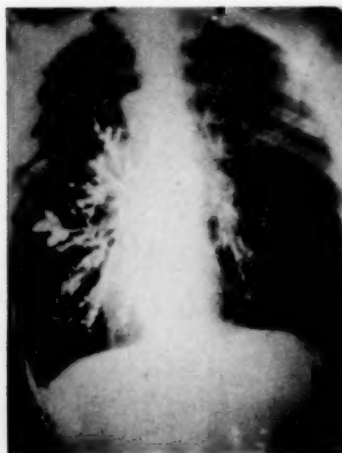


Fig. 4.—Roentgenogram of patient showing multiple large bronchiectatic cavities.



Fig. 5.—Roentgenogram of patient showing multiple grape-like bronchiectatic cavities on left and



Fig. 6.—Roentgenogram showing one large cavity with dilated bronchi radiating from it.

a positive sputum has not been available. In some of the cases following the injection of the iodized oil, a positive sputum resulted.

Coyon, Marty and Aime (17) used this method in a girl of fifteen and discovered a dilated bronchus on the left side. The history proved that this condition followed a bronchopneumonia from influenza more than six years before.

Svejcar and Dreuschuch (18) also used this method of diagnosis in children. They found bronchiectasis rather frequently drawing the conclusion that most cases of bronchiectasis in adults can be traced to childhood.

Effects on the Patient

As a general rule where the air passages have been carefully anesthetized, the patient experiences no disturbing after-effects. On the other hand, in some cases, there is a period of dyspnea coming on shortly after the injection. It is my observation that this is generally due to the fact that the oil has been injected too rapidly, plugging up the bronchi and giving the patient a sense of suffocation. In some cases a slight rise in temperature occurs after the introduction of the oil. This usually disappears within a day or two. Expectoration is usually increased. Injection of the oil is contra-indicated in febrile or cachectic patients or in those with cardiac decompensation.

Elimination of the Oil

A considerable portion of the oil is expectorated within the first twenty-four hours after injection. The remainder of the oil slowly disappears both by expectoration and by absorption. In one of our patients a trace of the oil was present eleven days after injection. Fig. 3. In two of Iglaue's cases (14) traces were demonstrable five weeks after injection. In one of Bronfin's (14) patients the iodized oil was found

in the lung sixteen weeks after injection. In spite of this fact the patient suffered no inconvenience.

Summary

1. Iodized oil injected into the bronchial tree gives valuable information hitherto unobtainable.

2. The method is free from dangerous after effects.

3. Where the supraglottic method is used no special training is necessary.

4. The method has great value in therapy due to the slow liberation of the iodine from the oil.

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DISCUSSION

DR. J. W. LAWS (El Paso, Tex.): I rise to commend the paper on the use of lipiodol in the taking of x ray plates of the chest in such conditions where the plates are unsatisfactory or do not correspond to the

symptoms of the patient. The use of lipiodol is very valuable in differentiating particularly bronchiectasis and in the location of cavities in locations where it may be somewhat obscured on account of haziness due to thickened pleura.

We frequently have sent to us in the Southwest patients with a diagnosis of pulmonary tuberculosis who do not have it. If lipiodol was not used the diagnosis of bronchiectasis was usually made by exclusion. Lipiodol now gives us definite information that we could not otherwise get.

It is also of value in injection of sinuses that lead deeply into tissues such as we sometimes have in tuberculosis of bony structures in the region of the sacrum, but returning to the use of it in x ray pictures of the chest I will state that with a little practice the introduction of the lipiodol by means of a syringe, having cocaineized the larynx and by the technic that has been given by Dr. Pritchard of Battle Creek, is not nearly as difficult as you might imagine it would be.

I want to commend the doctor for his paper and I want to recommend to you gentlemen who take x ray plates of the chest and are in doubt about your plates, try the use of lipiodol. It will give you a great deal of information.

DR. G. L. BROWN (Chicago, Ill.): I would like to add that if the doctor had used the lipiodol in the diagnosis of foreign bodies in the bronchi it is also of great help. He spoke mostly about diagnosis of pulmonary conditions of bronchiectasis but it seems to me that in localization of foreign bodies, such as tacks or pieces of nut shells, and conditions of that kind, this would be an ideal method of making the diagnosis. As that point wasn't mentioned, I would like to inquire if he has had any experience with it.

DR. A. F. TYLER (Omaha, Nebr.): In using lipiodol in localizing foreign bodies in air passages, especially in the non-opaque foreign bodies which are difficult or impossible to visualize on the x ray plate, I think that Chevalier, Jackson and his associates in Philadelphia have done more to make the diagnosis of foreign bodies in air passages accurately and positively than any one else, and they have contributed a number of articles to the literature bearing on that very subject.

DR. L. A. TRABELL (Battle Creek, Mich.): I am sure this paper of Dr. Tyler's was very exhaustive and very well prepared and treated in a very excellent manner.

I think Dr. Pritchard was one of the pioneers to use lipiodol in this country. He was very much pleased, in coming to this country, to find that we were able to put lipiodol into the lungs without using any anesthetic at all. Dr. Pritchard, in his first cases, always uses anesthesia. If he finds that particular patient is an unusually calm patient and has a throat in which there is very little spasm, on the second trial he quite frequently does this with no anesthesia at all, and I have seen him accomplish a great many in this way.

He also uses lipiodol not only for diagnostic purposes but also for therapeutic purposes. As Dr. Tyler said, it is contra-indicated in acute tuberculosis cases. Occasionally we get cases, which have been diagnosed as tuberculosis, sent to us from various parts of the country. We get a history of a chronic cough for a long time and an occasional fever, but on which the physical findings and x ray findings show very little if any.

In those cases we find that administration of lipiodol has varied in number from three to one dozen and has entirely cleared up symptoms which have persisted for a great many years. I can just give you briefly one case. A man, age thirty-six five feet six, inches tall, weighing 130 pounds; average weight 140. He was pale and nervous and tired too easily. A chronic cough persisted for eight years following influenza. At times the cough was increased in severity, a slight degree of fever was also present occasionally although not persistent and the patient complained of a heavy, dull pain in the middle of the sternum. He had been told that he had tuberculosis.

After careful physical, laboratory and x ray examination of the chest no abnormalities were found except over the bronchi. Iodized oil was introduced and bronchiectasis was shown on the edge of the right lower lobe. This is another place where it is especially valuable. The patient was given injections of ten c. c., once a week for six weeks. It is eight months since he reported and he has had no cough.

THE VALUE OF DYE IN GALL BLADDER EXAMINATIONS*

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The x ray examination of the gall bladder prior to the introduction of the use of the dyes was somewhat uncertain and on the whole rather unsatisfactory.

While some workers were reporting diagnostic accuracy to the extent of 90%, the average Roentgenologist was apt to be satisfied with about one in three or perhaps less, if based solely upon Roentgen findings.

We are many times accused by the clinicians and those less familiar with film interpretation, of being able to see shadows and observe changes in density, which to them do not exist. This, I believe to be true and due to the fact that the Roentgenologist's eye is not only better trained, but is kept more in practice and is therefore more accurate and efficient. However, I am inclined to the opinion that a careful history, together with the rather frequent percussory palpation of the right upper quadrant, supplemented by the dictum of "fair, fat and forty" in a chronic dyspeptic, may sometimes in a small measure influence our final conclusions in that large per cent of cases where the shadows in the right upper corner are indefinite, inconclusive or perhaps absent. This, I believe may account in a large measure for the difference in the per cent of accuracies in diagnosis as reported by different individuals.

It is an easy matter to make a diagnosis of gall stones if definite shadows are present, but it cannot be said positively that gall stones or a pathologic gall bladder do not exist if these changes in density are lacking. With our present day radiographic technic practically 100% of

gall stones containing calcium can be shown and a large percent of cholesterin and bile salt composition may be identified if the patient is properly prepared and a sufficient number of films of different density are obtained. The preparation of the patient is of vital importance and will be discussed later.

With the advent of the use of dyes in gall bladder visualization, a much broader field has opened for Roentgenologic diagnosis of this rather obscure organ.

Early in 1924 Graham and Cole (1) introduced their method of gall bladder visualization which was accomplished by the administration of the calcium salt of tetrabromphenolphthalein, which being excreted with the bile and collected in the gall bladder casts its shadow on the x ray film. However, this was soon abandoned for the sodium salt derivative, which they found less toxic, and in July, 1924 they reported the intravenous administration of the latter product in 55 cases with marked success but not altogether satisfactory, due to the fact that certain reactions were sometimes encountered and much precaution regarding the preparation of the patient and the administration of the drug was required. (2).

Whitaker and Milliken (3) did some experimental work on dogs determining the comparative value of sodium tetrabromphenolphthalein and sodium tetraiodophenolphthalein with the following conclusions: The relation of the opacity of the tetrabrom to the tetraiodo salt was approximately one to two. After administering a lethal dose to dogs and radiographing their gall bladders, it was found that gall bladder shadows were discernible in 81% of those to which the

*Read at fifth annual meeting, American College of Physical Therapy, Chicago, Oct. 22, 1926.

tetroido salt had been administered, while only 19% of the tetrabrom dogs showed shadows. Since the comparative opacity was about two to one in favor of the tetraiodo salt and the toxicity of the two being about the same, they concluded the tetraiodo salt to be one of choice since a much smaller dose would suffice and the danger of toxicity be thereby greatly lessened. This was a distinct advance but was still somewhat objectionable due to the intravenous administration.

In April, 1925 Meneese and Robinson (4) reported the oral administration of the sodium tetrabrom salt in 35 cases, with no severe reactions and relatively good results; the principle objection being the inability of many of the patients to retain the dye.

In order to escape the gastric irritability and the nausea and vomiting, attempts were made to administer the dye by the duodenal tube and per rectum (5) with varied success. The sodium tetraiodo salt was the dye of choice; the problem was to get it by the stomach without the usual gastric irritation, nausea and vomiting.

Whitaker, Milliken and Vogt (6) seemed to meet these requirements first, by the administration of the dye in the form of stearic acid coated pills. They reported satisfactory gall bladder shadows in 93% of sixty-six cases. Since this time the oral administration of the sodium tetraiodophenolphthalein salt in special prepared form has come into general use in roentgenology and in the hands of the rank and file is to be preferred to the intravenous administration, although it must be admitted that one can never be certain as to just how much of the dye has been absorbed as is the case with intravenous administration. It is not unusual, in fact one frequently finds much of the dye, sometimes capsules undissolved, in the colon. When such is the case you may not be sure as to the proper evaluation of the gall bladder shadow presented,

if any. Zink (7) calls attention to this, particularly in early pathological cases and no doubt rightly states that questionable findings following oral administration should be checked with the intravenous method. Our work has been confined wholly to the oral method.

TECHNIC

Given a case for gall bladder examination, we proceed as follows: If we are notified in advance, the patient receives an enema the evening before the morning of the first examination. No cathartics are administered as they tend to load the bowel with gas.

The patient reports the following morning an hour before time of examination. At this time they are given another enema, which is given slowly and retained for fifteen or twenty minutes, if possible, then followed by one c. c. of pituitrin per hypo. After this is expelled, we invariably find the colon empty and free from gas, a very essential point in this examination. Three to five films of different density are taken of the gall bladder area. This is accomplished by varying the penetration about two K. V. with each film. The patient is then instructed to eat the usual noonday meal, the evening meal to be fat free. They are given ten grains of the sodium tetraiodophenolphthalein for each twenty-five pounds of body weight and instructed to take it in three or four doses, one every fifteen minutes beginning at 8:30 P. M. With the first and the last dose, they get 20 grains of sodium bicarbonate and drink plenty of tepid water. They are instructed to lie down, turned to the right side during the time and for an hour following the taking of the dye. They report the following morning without breakfast. They are instructed to avoid all odor of food as it has been proven that even this was sufficient to stimulate contraction and emptying of the gall bladder.

A film is now taken approximately 12 hours after the ingestion of the dye, and one of three points is usually noted.

(1). Gall bladder shadow absent. If no shadow or only a faint shadow is present, subsequent examinations at two to three hour intervals are made, during which time all food is withheld. If a normal density shadow is not obtained after eighteen hours following the ingestion of the dye, interpretation is made. First, we must ascertain either by fluoroscopic examination or by film that the dye has been absorbed and is not in the colon.

(2). Gall bladder is filled but shadow is faint.

(3). Gall bladder is filled and of normal density.

Diagnosis of gall bladder pathology is dependent upon three factors:

(1). Power of the liver to secrete the dye.

(2). Patency of the cystic duct.

(3). Power of the gall bladder to concentrate its contained dye sufficiently to cast a normal shadow.

Therefore if no shadow is obtained, it means either:

(1). Disturbance of liver function with inability to excrete the dye. This may be more or less theoretical and remains to be proven.

(2). Occlusion of the cystic duct from any cause.

(3). Failure in power of gall bladder concentration.

(4). Failure in dye absorption or if patient has vomited profusely while taking the dye. These facts have been obtained at the beginning of the examination.

(5). Small, sclerosed, obliterated gall bladder lumen

If only a faint shadow is obtained and of about normal size, it may mean:

(1). Hepatic insufficiency.

(2). Insufficient bile concentration.

(3). Insufficient ingestion or absorption of the dye. If a sufficient amount of the dye has been absorbed in the absence of clinical signs bespeaking a liver insufficiency, if only a faint shadow presents, we feel justified in charging it to a failure of concentration which is practically always the result of some mucosal inflammatory process.

When the gall bladder fills and a fairly dense shadow is obtained, we are enabled to study the gall bladder much the same as the stomach following the ingestion of the opaque meal. Its size, shape, location and contour may be noted. As we have had to revise our idea as to the location of the stomach since the advent of the x ray, so we may expect to find the gall bladder far afield from the tip of the 9th costal cartilage. However, we are not so much concerned about its location, nor its size, particularly, if within reasonable limits, but we are interested in knowing how it functions. Therefore after having noted its ability to fill and concentrate the bile, we give the patient a glass of cream and the yolks of two eggs, and examine one to two hours later. The normal gall bladder will be anywhere from 50% reduced in size to completely empty on this examination, proving the elasticity and contractility of the walls, a condition that would not exist in a pathological condition.

After the filling of the gall bladder with the opaque dye, stones of cholesterol or bile salt formation that have been invisible on the first examination may be rescued as negative shadows on the opaque background. They, being of lesser density than the dye, show in contrast.

Change in normal contour may be noted; as hourglass contraction, dislocation of the fundus or other irregularity, which bespeak ad-

hesions. Many times an opaque meal may be administered showing the relation of the duodenum to the gall bladder and thereby assisting in demonstrating pericholecystic adhesions.

Our work has been confined wholly to the oral administration method and on the whole has been quite satisfactory of late, since more strict attention is being paid to the proper preparation of patients and the preliminary x ray examination before the administration of the dye. It is quite important that the patient thoroughly understands every detail relative to the taking of the dye and the avoidance of food, even its odor, until after the second examination.

The habit of physicians' administering the dye at their convenience at any time of day and then sending the patient in for pictures is bad practice and will invite failure in most instances.

About 25% of the cases experience some gastric distress or nausea, but never serious. About 12% vomit, but rarely until most of the dye has passed out of the stomach.

Seldom do we find it necessary to make a second effort with the intelligent patient, who is willing to co-operate. Diarrhea is a negligible factor.

On the whole we find cholecystography as satisfactory as gastro-intestinal roentgenography and believe it to be a great advance in the diagnosis of gall bladder pathology.

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DISCUSSION

DR. L. A. TRABELL (Battle Creek, Mich.): I want to briefly mention some of our methods that we use at Battle Creek. We use, as perhaps you know, the intravenous method of applying dye for gall bladder visualization. This particular method, by the way, is the one which has recently been adopted by Dr. Graham in his own clinic.

We have now a series of about 1500 injections in which we have used this dye, 100 of those in which we used the bromide preparation, the tetrabromphenolphthalein, and we have over 1200 in which we have used the iodine preparation.

We are now able to make certain interpretations by using this method which we claim is more accurate than the oral method. I think all men using the oral method will admit that in a certain percentage of the cases they are not sure of absorption, that in a certain number of cases the capsule is not absorbed. If the dye is injected directly into the vein you know exactly how much the patient has received and you know it is in the circulation. There is no question about its being somewhere in the digestive tract or going beyond.

Then similar to these other methods we take an observation after fourteen hours and the second observation at eighteen hours. The observation is classified into several classifications, the first in which the gall bladder is well rounded out and which empties on the second observation, the eighteen-hour observation, in which it is contracted now and in which there is no shadow at all. The second class of these in which we get no shadow, or a very faint shadow, we call a positive Graham test and we claim that it indicates some pathology either due to obstructive adhesions due to lack of secreting power, or perhaps some storing power of the the gall bladder.

We have had a series of about 156 of these cases which have come for operation, and of the first 145 we

found all but two had definite pathology. These gall bladders were checked up both bacteriologically and microscopically by our own laboratories and are also sent to Dr. Warthin at the Michigan State University. One of these two in which we apparently found no pathology had been having, previous to this time, upper right quadrant symptoms and these disappeared after the operation.

We claim that in these cases where there is no definite shadow or very faint that it has a decided increased value over the old method.

The other classifications are practically the same as the other cases. We perhaps make some slight variation as to size. It is always noted but it is not so very important.

Another thing we do take into consideration is a gall bladder which after an eighteen hour observation is still very full and has not been emptied. While this is not as accurate and we haven't the same amount of data to check this up, we rather claim that if there are symptoms, upper right quadrant symptoms accompanying this condition, it is rather indicative and we have found in many cases that we get a chronic catarrhal cholecystitis. We have had very few toxic effects. We had several cases in the first 100 in which we used the bromide solution. The patients themselves became quite alarmed but none of the doctors was alarmed.

During the last week I helped to give about forty-five Graham tests. We had no reactions in any of those cases. For six months while at the Battle Creek Sana-

tarium we had quite a few hundred cases, from four to sixteen a day, and during that time I had one patient who was sick. They were quite worked up but the next morning the patient got up feeling fine and had no further symptoms. During that time I also had one patient who had quite a sore arm. I applied heat and fomentations and in an hour's time the patient went to sleep.

We dilute the dye well with sterile water. We use the same apparatus that we use in giving the salvarsan. We get sterile water flowing freely into the vein. When we find that that is going into the vein the dye which has been previously prepared is poured into the steril water and that is diluted in that way from about seventy-five to 100 c. c. of water. When that is practically empty we follow that through with steril distilled water to rinse out the tube and make sure that the patient gets all the dye. If we have a person who is markedly above normal in size we add a certain percentage to that.

We have the patient keep quiet in the office or room adjoining the office for fifteen or twenty minutes and then we advise the patient to go to his room and remain quiet for the evening. They do not all do this. We advise them to confine their supper largely to carbohydrates. We give them fruits and fruit juices. Of course they can have potatoes, but we like to have them keep away from proteins. From most of those patients we have had no severe reaction at any time during the time I have been there, about a year and a half.

EDITORIAL

ARCHIVES OF PHYSICAL THERAPY, X-RAY, RADIUM

A Journal of Ideas and Ideals.

A. R. HOLLENDER, M. D., Editor
Suite 820—30 North Michigan Avenue,
Chicago, Illinois

Original contributions, exchanges and books for review should be forwarded to the Editorial Office. All business matters including advertising should be handled through the office of the managing editor, 1216 Medical Arts Bldg., Omaha, Nebraska.

ALBERT F. TYLER, M. D., Managing Editor

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Sixth annual meeting American College of Physical Therapy and Clinical Congress on Physical Therapy—Hotel Sherman, Chicago, October 31 to November 5, 1927.

PROGRAM CLINICAL CONGRESS OF PHYSICAL THERAPY

and

SIXTH ANNUAL MEETING

AMERICAN COLLEGE OF PHYSICAL THERAPY

Oct. 31 to Nov. 5, 1927

HOTEL SHERMAN—CHICAGO

SPECIAL RAILROAD RATES

Special railroad rates of one and one-half fares on the certificate plan have been granted for the Clinical Congress and American College of Physical Therapy by the following passenger associations:

Trans-Continental Passenger Association
Western Passenger Association
Central Passenger Association
Southwestern Passenger Association
Southeastern Passenger Association
New England Passenger Association
Trunk Line Association

A reduction of one and one-half for the round-trip on the "Certificate Plan" will apply for members (also dependent members of their families) attending the meeting of The American College of Physical Therapy to be held at the Hotel Sherman, Chicago. The arrangement will apply from the following territory:

Going Dates of Sale

Colorado (Julesburg only)	Missouri
Illinois	Nebraska
Iowa	No. Michigan
Kansas	No. Dakota
Manitoba (See Note)	So. Dakota Oct. 27-Nov. 2
Minnesota	Wisconsin
Colorado (except Julesburg)	New Mexico
Montana	Wyoming Oct. 26-Nov. 1
Utah	Oct. 25-31
Arizona	Nevada
British Columbia	Oregon
California	Washington
Idaho	Oct. 24-29

Note: Manitoba—on Great Northern, Northern Pacific and M. S. T. P. & S. S. M. Rys., also from Winnipeg via Canadian National and Canadian Pacific.

The following directions are submitted:

1. Tickets at the normal one-way tariff fare for the going journey may be bought on dates listed above (but not on any other date).

2. Be sure when purchasing your going ticket to ask the ticket agent for a certificate. Do not make the mistake of asking for a receipt. If, however, it is impossible to get a certificate from the local ticket agent, a receipt will be satisfactory and should be secured when ticket is purchased. See that the ticket reads to the point where the convention is to be held and no other. See that your certificate is stamped with the same date as your ticket. Sign your name to the certificate or receipt in ink. Show this to the ticket agent.

3. Call at the railroad station for ticket and certificate at least 30 minutes before departure of train.

4. Certificates are not kept at all stations. Ask your home station whether you can procure certificates and through tickets to the place of meeting. If not, buy a local ticket to nearest point where a certificate and through ticket to place of meeting can be bought.

5. Immediately upon your arrival at the meeting, present your certificate to the endorsing officer, as the reduced fare for the return journey will not apply unless you are properly identified as provided for by the certificate.

6. *No refund of fare will be made on account of failure to either obtain a proper certificate, or on account of failure to have the certificate validated.*

7. It must be understood that the reduction for the return journey is *not* guaranteed, but is contingent on an attendance of not less than 250 members of the organization and dependent members of their families at the meeting holding regularly issued certificates from ticket agents at starting point showing payment of normal one-way tariff of not less than 67 cents on the going trip.

8. A Joint Agent of the carriers will be in attendance on the days of the meeting to validate certificate. If you arrive at the meeting and leave for home prior to the arrival of the Joint Agent, or if you arrive at the meeting after the Joint Agent has gone, you cannot have your certificate validated, nor secure the benefit of the return reduction.

9. If necessary minimum of 250 regularly issued certificates are presented to the Joint Agent, and your certificate is validated, you will be entitled to a return ticket via the *same route* as the going journey at one-half of the normal one-way tariff fare from place of

meeting to point at which your certificate was issued up to and including November 9th, 1927.

10. Return tickets issued at the reduced fare will not be good on any limited train on which such reduced fare transportation is not honored.

ANNUAL COLLEGE BANQUET

The Annual College Banquet is the main social event of the Clinical Congress and annual meeting. The fellows of the college are urged to be present. Guests of the meeting and their ladies are cordially invited. Some interesting talks will be made by prominent men in the profession. The toastmaster for this occasion will be the incoming President, Dr. J. C. Elsom, University of Wisconsin, Madison.

Preliminary Banquet Program

Introductory Remarks and Welcome

DR. A. R. HOLLENDER.

Chairman, Convention Committee.

Physical Therapeutics in the Medical School Curriculum

DR. J. C. ELSOM.

Toastmaster and President

Progress of the American College of Physical Therapy
During My Incumbency

DR. DISRAELI KOBAK.

President, 1926-27

Early Pioneers in Physical Therapy

WILLIAM BENHAM SNOW, New York City
Attitude of the County Medical Society Towards the
Promotion of Scientific Physical Therapy

DR. J. H. HUTTON, Secretary

Chicago Medical Society

Informal Talks by Many Others to Be Selected by the
Toastmaster

MUSIC—ENTERTAINMENT

Banquet tickets will be obtainable at Registration Desk

HOTEL ACCOMMODATIONS

The new Hotel Sherman, which has been selected as headquarters for the 1927 meeting of the American College of Physical Therapy, is located at Clark, Randolph, Lake and LaSalle streets, in the heart of the loop, with most of the principal theatres and stores within a radius of two and one-half blocks. This hotel, which has been designed for the handling of conventions, will provide an exhibit hall which will directly connect with the meeting room.

The fact that the new Hotel Sherman has six restaurants is of special interest to the delegates, inasmuch as a wide range of prices and service is provided within the hotel building from the famous College Inn to the sandwich shops. It is possible to get club breakfasts at 45c, luncheons for 50c or 60c, and dinner for 90c and

\$1.25 in some of the restaurants. The College Inn is famous for its \$1.00 luncheon. This restaurant has been patronized at noon by Chicago business men and convention delegates for a great many years.

These restaurants include (aside from the College Inn) the Celtic Grill, Clark Street Coffee Shop, Old Town Luncheon Room, Lake Street Sandwich Shop and Clark Street Sandwich Shop.

The new Hotel Sherman makes a special effort to take care of each individual reservation at the rate requested, and the special rate for the American College of Physical Therapy begins at \$3.00 for single rooms and \$5.00 for double rooms. The rates range as follows: Single rooms, \$3.00, \$3.50, \$4.00, \$4.50, \$5.00, \$5.50 and \$6.00, and for rooms with double beds, \$5.00 and \$6.00; rooms with twin beds, \$7.00, \$8.00 and \$10.00. Two single connecting rooms are priced at \$6.00 to \$10.00. New Hotel Sherman has 1,700 rooms each with bath, and 75 per cent of these rooms are priced at the hotel's minimum rate of from \$3.00 to \$5.00.

We respectfully advise you to send in your reservation early, since the hotel can give you better service when they know well in advance what the Association requirements will be, or by writing to the Chicago Office of the College, Suite 820, 30 N. Michigan Ave., Chicago.

DIRECTORY OF ROOMS FOR GROUP AND SECTIONAL MEETINGS AND SCIENTIFIC AND COMMERCIAL EXHIBITS

INSTRUCTION CLASSES

Monday, October 31st

Group (1) Crystal Room

Group (2) Gray Room

Group (3) West Room

Group (4) Club Room

Tuesday, November 1st

Group (1) Crystal Room

Group (2) Louis XVI Room

Group (3) West Room

Group (4) Club Room

Wednesday, November 2nd

Group (1) Crystal Room

Group (2) Gray Room

Group (3) West Room

Group (4) Club Room

JOINT SESSION AND FORMAL OPENING OF CLINICAL CONGRESS ASSEMBLY

Grand Ball Room

SECTIONAL MEETINGS

Thursday, November 3rd

Section on Medicine—Pediatrics—Diagnosis—
Endocrinology

Grand Ball Room

Section on Surgery—Gynecology—Urology—
Orthopedics

Louis XVI Room

Section on Eye, Ear, Nose and Throat
Club Room

Friday, November 4th

JOINT MEETING OF ALL SECTIONS

Grand Ball Room

The Commercial and Scientific Exhibits will be held in the Exhibit Hall on the mezzanine floor.

The Registration Desk will be located at the entrance of the exhibit hall.

SCHEDULE—SCHOOL OF INSTRUCTION

Classes, Monday, October 31st, 1927

	Group 1	Group 2	Group 3	Group 4
9 to	Galvanism—	Sinusoidal Currents—	X Rays—Fouts	Medical Diathermy—
10	Giesey	Coulter	Radium—Hanford	Titus
10 to	Medical Dia-	Galvanism—	Sinusoidal Currents—	Ultra Violet Therapy—
11	thermy— Walke	Waddington	Coulter	Howell
12 to	LUNCHEON			
2	Inspection of Scientific and Commercial Exhibits			
2 to	Static	Currents	Medical Diathermy—	Galvanism—
3		Titus	Chapman	Morse
3 to	Ultra Violet	X Rays—Tyler	Static	Currents
4	Therapy—Kime	Radium—Schmitz		Titus
4 to	X Rays—Fouts	Ultra Violet Therapy—	Ultra Violet Therapy—	Sinusoidal Currents—
5	Radium—Tyler	Kime	Schiller	Morse
		Therapeutic Exercise—	Hydrotherapy—	Therapeutic Exercise—
	Hydroth'y—Pope	Ewerhardt	C. E. Stewart	Elsom
5 to	Therapeutic Ex-	Hydrotherapy—	Therapeutic Exercise—	Hydrotherapy—
6	ercise—Elsom	C. E. Stewart	Ewerhardt	Pope

6 to DINNER

7:30 Inspection of Scientific and Commercial Exhibits

7:30 Extension of the Surgery of Neoplastic Diseases by Electrothermic Methods

to 9 George W. Wyeth, M. D., New York City

Classes, Tuesday, November 1st, 1927

9 to	Biophysics of Ultra Violet Light—	Demonstration of	
10	Bachem	Diathermy Technic—	Autocondensation Methods
10 to	Industrial Physical	H. E. Stewart	C. E. Stewart
	Therapy—		
11	Walke	Biophysics of Ultra Violet Light—	
	Chapman	Bachem	
11 to	Demonstration of		
	Diathermy Technic	Surgical Diathermy—	Surgical Diathermy—
12	Therapy—	Giesey	Willmoth
	Waddington		
	Walke		

LUNCHEON

Inspection of Scientific and Commercial Exhibits

2 to	Autocondensation	Autocondensation	Industrial Physical	Demonstration of
	Methods—	Methods—	Therapy—	Diathermy Technic—
3	Grover	C. E. Stewart	Duval	Chapman
3 to			Autocondensation	Industrial Physical
	Oral Diseases		Methods—	Therapy—
4	Lurie		C. E. Stewart	Duval
4 to	Surgical Dia-	Surgical Diathermy		Oral Diseases
5	thermy—Kolischer	Kobak		Lurie

Classes, Wednesday, November 2nd, 1927

		Demonstration Clinic	Demonstration Clinic	Demonstration Clinic
9 to	Massage—	Light Therapy—	Galvanic and Sinusoidal	Galvanic and Sinusoidal
10	Pope	Howell	Currents—Elsom	Currents—Morse
10 to	Urology—	Massage—	Eye, Ear, Nose and Throat	Eye, Ear, Nose and Throat
11	Jones	Ewerhardt	Denman	Wahrer
				Demonstration Clinic
11 to	Dermatology—	Urology—	Massage—	Light Therapy—
12	Lester Hollander	Hirsch	Pope	Howell

LUNCHEON

Inspection of Scientific and Commercial Exhibits

		Demon'tion Clinic		
2 to	Light Therapy—	Dermatology—	Urology—	Massage—
3	Schiller	Norris	O'Connor	Ewerhardt
	Demon'tion Clinic	Demonstration Clinic		
3 to	Galv. & Sinusoidal	Galvanic and Sinusoidal	Dermatology—	Urology—
4	Cur'ts—Waddington	Currents—Giesey	Greene	Nelson
4 to	Eye, Ear, Nose	Eye, Ear, Nose and	Demonstration Clinic	
	and Throat—	Throat—	Light Therapy—	Dermatology—
5	Cottle	Novak	Fouts	Greene
5 to	Gynecology—	Gynecology—	Gynecology—	Gynecology
6	Chapman	Willmoth	Schmitz	Giesey

COMMERCIAL EXHIBITS

Acme International X Ray
 Atlas Electrical Devices Co.
 American Journal of Physical Therapy
 Archives of Physical Therapy, X Ray, Radium
 Bleadon-Dun Company
 Burdick Cabinet Company
 Battle Creek Food Company
 Belgard Spero Optical Co.
 Cameron Surgical Company
 Electric Solar Company
 Ellis Mfg. Company

The Fair
 H. G. Fischer & Company
 General X Ray Company
 Harold Surgical Instrument Company
 Hanovia Chemical & Manufacturing Company
 High Tension Company
 Paul E. Johnson, Inc.
 McIntosh Electrical Corporation
 Victor X Ray Corporation
 Vitaglass Corporation
 Wappler Electric Company

These exhibits will be housed in the large exhibit hall of the Hotel Sherman. No doubt many new things will be shown. Several of the manufacturers have taken large spaces in order to accommodate the large attendance of physicians anticipated at this year's gathering.

**OPENING OF THE CLINICAL CONGRESS
AND SIXTH ANNUAL MEETING****Wednesday, November 2nd, 7:30 P. M.**

Welcome—

A. R. HOLLENDER, M. D.
 Chairman, Convention Committee

**1. Address—Progress in Physical Therapy During the
Past Year**

DISRAELI KOBAC, M. D., Chicago
 President of the College

The evident function of critical co-operation by the formation of the Council of Physical Therapy.

The adoption of Physical Therapy in the curriculum of many important medical centers has practically eliminated the teaching of this branch of medicine from the hands of the itinerant teacher and manufacturer.

The elimination of mysticism and the introduction into the teaching of Physical Therapy by the standard of a critique of pure science

Newer advances, limitations and future problems in the field of radiant energy—therapy.

**2. Address—Vital Problems in the Teaching of Physical
Therapy**

J. C. ELSOM, M. D., Madison, Wis.

In a sense, Physical Therapy is a specialty in medicine, requiring special study, training and technic, but perhaps in no other specialty is a broad conception of medicine and surgery more necessary. The medical college is the obvious source of instruction; teaching problems differ in no essential detail from other subjects, but the method must be thorough, rational, specific and interesting.

**SYMPOSIUM ON CANCER—Indications, Limitations
and Technic of Electro-Surgical Methods****3. Status of Diathermy in Cancer Therapy**

GUSTAV KOLISCHER, M. D., Chicago

4. Selected Surgical Procedures with Surgical Diathermy

GRANT E. WARD, M. D., Baltimore

General consideration of the uses of high frequency current in non-malignant surgical conditions. Resume of some experimental work done in an effort to develop a current which will permit operation on parenchymatous organs, without bleeding. Lantern slide demonstration.

5. Palliative Treatment of Inoperable Carcinoma.

JOSEPH K. NARAT, M. D., Chicago

Tumor masses of inoperable cancers should not be left untreated because the toxic products of their abnormal metabolism are the main cause of cachexia; the frequently occurring necrosis of the cancerous tissues produces bad odor and discharge. Surgical diathermy is the method of choice for the removal of tumor masses in inoperable cancers, as it allows a delicate regulation and can be applied with less shock and quicker results than any other method of palliation.

**6. The Value of Surgical Diathermy in the Treatment
of Tumors of the Bladder. (Illustrated by
Lantern Slides.)**

A. G. FLEISCHMAN, M. D., Des Moines, Iowa

Source of information obtained by the writer in the preparation of the communication and views of other investigators. Diagnosis of Tumors of the Bladder. Report of 15 cases treated by this method. Details in the technique of the treatment, and advantages gained by Surgical Diathermy. The superiority of this method over any other method at the present time for the Treatment of Tumors of the Bladder.

Discussion of the foregoing four papers by Disraeli Kobak, M. D., Chicago; Clinton K. Smith, M. D., Kansas City, Mo.; Budd C. Corbus, M. D., Chicago; A. L. Yocum, Chariton, Iowa; A. David Willmoth, M. L., Louisville; Vincent J. O'Connor, M. D., Chicago, and Gustavus M. Blech, M. D., Chicago.

SECTION OF MEDICINE—PEDIATRICS—DIAGNOSIS ENDOCRINOLOGY

Thursday, November 3rd, 9 A. M.
SYMPOSIUM ON DERMATOLOGY

1. The Relationship of Physical Therapy to Dermatology

LYNNE B. GREENE, M. D., Kansas City

2. Physical Therapy in Fungus Disease

A. F. TYLER, M. D., Omaha, Nebr.

Brief history of Fungus Diseases. Citation of statistics showing relative frequency in mid-western agricultural area. Brief discussion of pathology. Discussion of the use of physical therapy in conjunction with the other methods of treatment of these diseases.

3. Some Recognized Uses of Ultra Violet Irradiations in Skin Diseases

CLAUDE B. NORRIS, M. D., Youngstown, O. Ultra Violet irradiations have been irrationally used by physicians and others who have had faint conception of its rationale and it is time for the delimitation of its field in therapeutics. Carefully checked scientific observations are safer than enthusiasms. Any favorable effect must be regarded as constitutional and local. Consideration of specific diseases of the skin advantageously treated by this means, with citation of causes and results.

4. The Evaluation of Physical Therapy in Dermatology

LESTER HOLLANDER, M. D., Pittsburgh, Pa.

Roentgen ray, ultra violet ray, electro-cautery and cryo-therapy have been potent factors in the development of rational skin therapy. We must bear in mind indications of therapy and these will be given. The talk will be illustrated profusely with lantern slides to show indications for the establishing of physiotherapy. Technique will be outlined, both in talk and formal paper.

5. The Infra-roentgen Rays (super soft x rays) in Dermatology. (Lantern slide demonstration.)

JOSEPH JORDAS ELLER, M. D., New York

Discussion of the foregoing papers opened by Erwin P. Zeisler, M. D., Chicago; Francis Senear, M. D., Chicago.

6. The Treatment of Post-febrile Conditions with Special Reference to the Influenzal Type

BENJ. H. SHERMAN, M. D., Dexter, Iowa

Septic sore throat, lung abscess, multiple lung abscesses, delayed resolution following pneumonia, bronchitis, especially when accompanied by a severe dry cough. Bronchiectasis.

Discussion opened by R. W. Fouts, M. D., Omaha, and H. H. Redfield, M. D., Chicago.

7. Infections and Toxemia of the Biliary Tract with Medical and Physical Therapy

HAROLD M. JOHNSON, M. D., Buffalo, N. Y.

In physiology there is one statement on which I am going to base many of my ideas. Any agent that causes a hemolysis of red corpuscles increases the flow of bile, therefore, any disease or toxemia which causes a disturbance in the circulatory system must react on the biliary tract or vice versa, any disease of the biliary tract must act or cause a toxemia in the circulatory system which is going to have an effect on the rest of the body.

Discussion opened by Disraeli Kobak, M. D., Chicago, and Curran Pope, M. D., Louisville, Ky.

8. Some Types of Neuritic Reflex Pains and Their Treatment by Physical Measures

WILLIAM MARTIN, M. D., Atlantic City

These painful reflexes may be from a true neuritis or from an irritable nerve, such as perineuritis. Some knowledge of the great nervous system is essential and the local nerve distributions of parts involved. Types of referred pains include torticollis and occipital headaches, painful shoulder, elbow and fingers, precordial pain simulating true angina pectoris, backache, knee joint pains, spasm of the calf muscles and flat foot with painful heel and toes. Method of differentiating these given and a general resume of treatment, with some details of the more particular conditions.

Discussion opened by J. E. Waddington, M. D., Detroit, and T. B. Lacey, M. D., Glenwood, Iowa.

9. Ultra Violet Radiation in the Therapy of Pulmonary Tuberculosis

H. H. REDFIELD, M. D., Chicago

General practitioner versus the Sanitarium. Adaptability for home treatment. Causes of failures in treatment. Classes of cases suitable for radiation. Outline or selection of cases. Method of application of quartz lamp. Water cooled vs. air cooled lamps. Influence of calcium content of blood. Endocrines as accessory treatment. Personal equation in giving radiations.

Discussion opened by Emil C. Duval, M. D., Chicago, and Ellis Freilich, M. D., Chicago.

Afternoon—2 O'Clock

10. Status of Physical Therapy in Obesity

MAXIMILLIAN KERN, M. D., Chicago

1. Treatment of obesity is one of metabolism and can only be approached from that standpoint. 2. Whether obesity is of the exogenous or endogenous type the considerations are of paramount importance. 3. The use of the x ray as a diagnostic and therapeutic agent in pituitary obesity merits serious consideration. 4. A study of the blood chemistry will frequently reveal a disturbance of the calcium and phosphorus metabolism, and the ultra violet light is the one known agent capable of influencing such conditions. 5. Ovarian conditions producing obesity are frequently influenced by x ray, ultra violet and diathermy alone or in combination.

11. The Perils of Obesity—What Can Physical Therapy Do?

J. C. ELSOM, M. D., Madison, Wis.

Alimentary and endocrine causes of obesity; abnormal deposits of fat are sources of danger and interference to the functions of muscles, circulation, respiration, and to many of the important organs (kidneys, liver, etc.) Exercise and diet have been greatly abused in reduction treatment. The dangers of mail order systems of reducing will be considered; each patient is a problem in himself. Medical treatment is frequently necessary. Use of physical agencies, and some radically different forms of treatment are suggested.

Discussion of the two foregoing papers opened by Curran Pope, M. D., Louisville; Frederick G. Morse, M. D., Boston; J. H. Hutton, M. D., Chicago.

12. Six Years' Experience in the Treatment of Pneumonia with Diathermy

HARRY EATON STEWART, M. D.,

New Haven, Conn.

Early use. Hospital staff checking of diagnosis and results. Control groups. Use of diathermy abroad. Modification of technique indicated by experience. Possibilities of intensive treatment illustrated by case reports. Present status and indications for the future.

Discussion opened by Lloyd M. Otis, M. D., Celina, Ohio, and Gage Clement, M. D., Duluth, Minn.

13. The Measurement of Ultra Violet Ray

ARTHUR E. SCHILLER, M. D., Detroit, Mich.

Review of literature on the measuring of the density of ultra violet light. The inadequacy of methods of measurement up to the present time shows the need of a method which expresses erythema units in a

definite system of measurement. This is important because, with a definite system of measurement, the erythema unit of any lamp either Carbon Arc, Iron Arc, or Quartz lamp may be expressed in terms of definite unit and thus may be repeated as required. The work of Dr. Janet H. Clark on the lithophone unit is reviewed. Lantern slides of comparative erythema and lithophone units will be shown. The value of this method will be self-evident.

Discussion opened by Chas. E. Stewart, M. D., Battle Creek, and Norman E. Titus, M. D., New York City, N. Y.

14. Blending of Physical Agents

J. U. GIESEY, M. D., Salt Lake City

Carthage, Mo.

The need for a consideration of the various blendings and shadings of Physical Modalities. Physics and effects of the various modalities more commonly employed. "Aiming"—at the condition to be attacked. The building of the Physical Therapeutic Prescription simple or combined, for single or blended effect in a parallel fashion to the writing of a chemical prescription.

Discussion opened by Edwin N. Kime, M. D., Indianapolis, and W. B. Chapman, M. D.,

15. The Physiological Action of Diathermy in Pneumonia

GAGE CLEMENT, M. D., Duluth, Minn.

A brief discussion of the pathology of lobar and broncho-pneumonia. Their clinical and radiological differences and similarities. The effect of heat upon the different infecting organisms. The cause of the crisis in lobar pneumonia. The physiological action of diathermy in aborting pneumonia and hastening recovery. Empyema. A few brief case reports. Lantern slides.

Discussion opened by Chas. Eaton Stewart, M. D., New Haven, and Benj. H. Sherman, M. D., Dexter, Iowa.

16. The Treatment of Diabetes

T. T. GIBSON, M. D., Middlesboro, Ky.

Some of the most probable causes of Diabetes, those organs which have to do with the production of Diabetes Mellitus because they fail to function. The correct blending of different wave lengths of radiation, will restore to health a large per cent of cases of Diabetes.

Discussion opened by A. E. Schiller, M. D., Detroit, and M. J. Breuer, M. D., Lincoln, Nebr.

17. Physical Therapy in Relation to the Endocrine Glands

JAMES H. HUTTON, M. D., Chicago

This paper will deal especially with x ray and radium in the treatment of goiter. Toxic and non-toxic, exophthalmic and adenoma with hyperthyroidism. The same measures directed at the pituitary for the relief of uterine hemorrhage. The treatment of persistent thymus and the x ray exposure of the ovaries for the purpose of rejuvenation and for uterine fibroids.

Discussion opened by Curran Pope, M. D., Louisville, and Maximillian Kern, M. D., Chicago

18. X Ray Diagnosis of Non-Tuberculous Pulmonary Diseases

AARON ARKIN, M. D., Chicago
Importance of x ray in differential diagnosis. Bronchus carcinoma is not a rare disease. Clinical types. Primary and secondary lung tumors. Solitary or multiple sharply outlined shadows in the lung may be produced by tuberculosis, lymphogranuloma, syphilis, metastases, echinococcus, or benign tumors. Mediastinal shadows in several diseases will be demonstrated.

Discussion opened by A. F. Tyler, M. D., Omaha, and L. A. West, M. D., Des Moines.

SECTION OF SURGERY—GYNECOLOGY—

UROLOGY—ORTHOPEDICS

Thursday, November 3rd, 9 A. M.

1. Physical Means in the Correction of Lower Back-aches

F. H. EWERHARDT, M. D., St. Louis
The intention of this paper is to present diagnosis and therapeutic measures for the correction of certain lower back pains due to functional causes. Especially those concerned with incorrect posture, faulty position of pelvis, and unbalanced condition of musculature about the pelvic girdle.

Discussion opened by F. H. Walke, M. D., Shreveport, La., and H. E. Stewart, M. D., M. D., New Haven.

2. Status of Physical Measures in the Treatment of Anal and Rectal Diseases

CHARLES J. DRUECK, M. D., Chicago
Physical Therapy is not a substitute for surgery or any other tried procedure, but is a valuable adjunct in selected disturbances of the pelvic bowel, such as Colo-Proctitis; Fecal Impaction; Rectal and Anal Tuberculosis, Ulcers and Malignancies; Peri-Rectal Abscesses and Fistulae and in the Post-Operative Convalescence.

Discussion opened by A. David Willmoth, M. D., Louisville, and F. E. English, M. D., Saginaw, Mich.

3. Physical Therapy in Gonorrheal Arthritis

JACOB GUTMAN, M. D., Brooklyn, N. Y.

Diagnostic features of gonorrheal arthritis. Frequency of joints involved. Analysis of 388 cases of arthritis. Vaccines. Diathermia. High Wattage therapy in gonococcus infections.

Discussion opened by S. C. Woldenberg, M. D., Chicago, and C. M. Westerman, M. D., St. Louis, Mo.

4. The Use of Radium in the Treatment of Uterine Hemorrhage

HAROLD SWANBERG, M. D., Quincy, Ill.

Uterine hemorrhage is a symptom. Its cause should be ascertained. Causes of hemorrhage are given. Importance of accurate diagnosis. Indications and contra-indications for radium. Properly used, radium is very successful. Construction of radium applicators and technic of applying. Great importance of proper radium dosage. Results of the treatment. Radium versus surgery. Summary. Conclusions.

Discussion opened by Henry Schmitz, M. D., Chicago.

5. Experiments with Diathermy in Surgical Shock

URSUS V. PORTMAN, M. D., Cleveland

Rationale and results of the use of diathermia in the prevention and treatment of surgical shock as investigated at the Cleveland Clinic. Prevention and treatment of post operative pneumonia and collapse of the lung by diathermia.

Discussion opened by Disraeli Kobak, M. D., and Gustavus M. Blech, M. D., Chicago.

6. Newer Concept of the Management of Carbuncles

A. DAVID WILLMOTH, M. D., Louisville

Character of infection, the method of spreading, dangers of carbuncles especially those about the face. Many cases in elderly people and those who are diabetics. Inability of the old method, the use of Carbolic acid to reach all points of infection. The effort to better control infection by the crucial incision. The use of the cautery. The disadvantages of the cautery. The great advantage of the High Frequency currents over any of the other known measures to control infection. No hemorrhage, no shock. Rapid healing. Small and pliable scar.

Discussion opened by J. U. Giesey, M. D., Salt Lake City, and F. L. Nelson, M. D., Ottumwa, Iowa.

7. Present Day Status of Physical Methods in Surgical Diseases

GUSTAVUS M. BLECH, M. D., Chicago

The therapeutic effectiveness of the diverse physical agents in surgical diseases can be properly evaluated only by a combination of clinical observations and theoretic considerations. Diathermy is valuable not only as a means of coagulating tissue, but as a non-operative method in a number of surgical conditions. Resume of indications and contraindications. A similar situation exists with reference to actinotherapy. Its value in certain surgical lesions and conditions, as shown by actual clinical experience.

Discussion opened by Carl Beck, M. D., Chicago, and Grant E. Ward, M. D., Baltimore.

8. Some Experience with the Use of Radium in Urology

LEO C. DUBOIS, M. D., Chicago

The effect of radium on tissue in general. The use of radium in urology. (Historical.) The selective effect of radium on certain types of tissue. The use and effect of stimulating doses of radium on urethral pathology.

Discussion opened by Harry Katz, M. D., Chicago, and Wm. F. Martin, M. D., Battle Creek, Mich.

Afternoon—2 P. M.

9. Bladder Decompression in Prostatic Hypertrophy

EDWIN W. HIRSCH, M. D., Chicago

The reduction in mortality following prostatectomy has in a large measure been due to properly reducing bladder pressure and blood chemistry before operation. This paper details methods advisable and technic used.

Discussion opened by H. C. Rolnick, M. D., Chicago, and A. G. Fleischman, M. D., Des Moines.

10. The Role of Physical Therapy in Osteomyelitis

PHILIP KREUSCHER, M. D., Chicago

Two varieties of osteomyelitis are differentiated: (1) Traumatic; (2) Metastatic. The treatment is vastly different in the individual types. Physical therapy is probably never indicated in the early stages. The focus must be removed; the sequestrum must be eradicated; the infected bone is fully exposed and brought as near the surface as possible. The greatest cause for failure of cure has been in the eradication of the infection from the soft parts. Here physical therapy plays its greatest role.

Discussion opened by Emil C. Duval, M. D., Chicago, Frank H. Walke, M. D., Shreveport, and S. C. Woldenberg, M. D., Chicago.

11. Advantages of Co-ordinated Physical Therapy Urologic Diseases

WALTER F. MARTIN, M. D., Battle Creek

The object of the paper will be to outline the system of practical physical therapeutic methods as used in our daily work. We hope to show that more successful results follow the use of Dietetics, Hydrotherapy, Electrotherapy, Rest and Exercise, when combined and used as a system in the treatment of the patient. Combinations of treatments as used in treating disease entities will be outlined.

Discussion opened by A. E. Jones, M. D., Chicago, and Edwin W. Hirsch, M. D., Chicago.

12. The Therapeutic Value of Diathermy in Urology

LOUIS WINE BREMMERMAN, M. D., Chicago

Although the discussion under this title necessarily must be rather comprehensive we will endeavor to bring to your attention the efficacy of diathermy not only in surgical lesions of the uro-genital tract, but will consider its value in medical pathology. We will offer for discussion various modes of technique employed in the treatment of kidney, bladder, prostatic and vesicular lesions.

Discussion opened by A. E. Jones, M. D., Chicago, and A. G. Fleischman, M. D., Des Moines, Iowa.

13. Sinusoidal Currents—Their Mechanism and Effects in Constipation

FREDERICK H. MORSE, M. D., Boston

Alternating and direct sine currents in modern therapeutics. Importance of recognizing physiological action in impaired muscles and neuron when applying methods for restoration of function. Wave current stimulation used for relief of the various forms and degrees of paralysis, including hollow viscera as might apply to infantile and post traumatism and intestinal stasis.

Discussion opened by Mary Arnold Snow, M. D., New York, and J. E. G. Waddington, M. D., Detroit, Mich.

14. The Removal of Hemorrhoids by Means of the High Frequency Current. (Illustrated with moving pictures).

WILLIAM BIERMAN, M. D., New York City

Advantages of the use of the high frequency current. Its use also in the treatment of associated conditions, polypi, fissures and prolapse. Description of techniques employed, coagulation electric clamp, desiccation, fulguration, grounded oudin; results.

Discussion opened by J. U. Giesy, M. D., Salt Lake City, and Chas. J. Drueck, M. D., Chicago.

15. Surgical Diathermy in Accessible Neoplasms

F. L. NELSON, M. D., Ottumwa, Iowa

Discussion opened by Gustav Kolischer, M. D., Chicago.

16. A New Technic in the Use of Diathermy in Pelvic Diseases

CLARENCE M. WESTERMAN, M. D., St. Louis, Mo.
A newly designed belt. Indifferent electrode which can be likened to the rim of a wheel. The active electrode representing the hub and the heat radiation the spokes of the wheel. More concentrated and centralized heat around orificial electrodes in treating pelvic disorders in both male and female by this method.

Discussion opened by **A. David Willmoth, M. D.,** Louisville.

17. Physical Agents in the Treatment of Hemorrhoids and Other Rectal Diseases

F. W. ENGLISH, M. D., Saginaw, Mich.
Physical Agents in the Treatment of Hemorrhoids and Other Rectal Diseases will include the ambulant methods of treating and curing not only hemorrhoids, but a multitude of organic and functional disturbances of this part of living anatomy which heretofore have required strictly surgical methods.

Discussion opened by **Frank H. Walke, M. D.,** Shreveport, La.

18. The Treatment of Bones and Joints with Physical Therapy

FRANK H. WALKER, M. D., Shreveport, La.

Discussion opened by **Emil C. Duval, M. D.,** Chicago.

SECTION OF EYE—EAR—NOSE—THROAT ORAL DISEASES

Thursday, Nov. 3—9 A. M.

1. The Treatment of Sinus Infections by Physical Agents

FRANK T. WOODBURY, M. D., New York City
Acute sinusitis, symptoms, signs. Chronic sinusitis, symptoms, signs. Etiology Nasal and constitutional; predisposing and exciting. Prevention by physical agents. Treatment by physical agents. Report of cases.

Discussion opened by **Frank J. Novak, Jr.,** Chicago.

SYMPOSIUM ON THE EAR

2. Physical Therapy in Diseases of the Ear

FREDERICK L. WAHRER, M. D., Marshalltown
Careful differential diagnosis is essential to successful treatment. Middle ear disease is potentially dangerous and should receive careful consideration. Middle ear disease is secondary to nose and throat infections. Causative factors must be eliminated before treatment will be successful. No patient should be subjected to mastoidectomy until other

methods fail. Physical therapy is not a substitute for other methods. It is an adjunct of great value.

3. Skin Affections of the External Ear

LOUIS SAVITT, M. D., Chicago
Etiology and pathology. Complications. Review of methods of treatment in vogue. Use of radiant heat-light. Action of ultra violet radiation. Dosage and technic. Case reports and lantern slide demonstrations.

4. Radiotherapy in Selected Cases of Chronic Ear Suppurations

IRA O. DENMAN, M. D., Toledo, Ohio
Chronic Aural Suppurations favorably influenced by irradiation. First, those described in previous article in which patency of Eustachian tube is re-established by resolution of lymph-œdema in nasopharynx, particularly the fossa of Rosenmueller. In this x ray plays leading role. Second, Chronic suppurations with patent tube. Necrosis—the Scarlet Fever type, correlation of stimulative x ray doses and ultra violet rays.

5. Chronic Otorrhea—Its Management with Zinc Ionization

HAROLD L. WARWICK, M. D., Ft. Worth, Tex.
Zinc ionization alone will not result in a permanent cessation of symptoms in every case of suppurative otitis media. Cases should be carefully selected and other foci about the head should be cleaned up. The technique presents no difficulties from physical standpoint. The apparatus is rather inexpensive and the results are uniformly good in selected cases.

6. Further Experiences with Diathermy and Negative Galvanism in Partial Deafness

A. B. HOLLENDER, M. D., and
M. H. COTTLE, M. D., Chicago
Review of preliminary report in Archives of Otolaryngology of April, 1926. A more extended use of the audiometer in diagnosis and check-up of progress made. Improved electrodes and technic. Report of over one hundred consecutive undifferentiated cases treated; results; conclusions.

Discussion of the foregoing five papers by
S. T. Rubley, M. D., Grand Rapids, Mich.;
Ellis G. Linn, M. D., Des Moines; **Harry G. Thometz, M. D.,** Chicago, and **Frank J. Novak, Jr.,** Chicago.

7. The Application of Physical Measures to the Head

WILLIAM A. LURIE, M. D., New Orleans, La.

Discussion opened by **M. H. Cottle, M. D.,** Chicago.

A "pioneer spirit" is required to use physical means. The effect of this form of treatment is so different

from the older forms that one may suspect a mistake in diagnosis was made or that pathology is changing. Our conception of pathology should be altered to conform to treatments by physical means.

8. Physical Aids as Adjuncts in the Treatment of Certain Eye, Ear, Nose and Throat Conditions

H. L. BROOKS, M. D., Michigan City, Ind.
Radium therapy for malignant growths involving the eyeball or orbital cavity. Status of radium therapy for cataracts. Roentgen ray for catarrhal deafness when there are marked lymphoid masses in the neighborhood of the fossa of Rosenmuller. Diathermy stimulates healing and resorptive tissues reaction. Use of zinc ionization in suppurative otitis media.

Discussion opened by Thomas C. Galloway, M. D., Evanston, Ill.

Afternoon—2 O'Clock

9. Technique and Application of the Wave Length in Dentistry

C. B. HOLMAN, D. D. S., St. Louis, Mo.
Action of the different length of Ultra Violet Rays on gum tissue. Analgesic properties. Bleaching properties on Tooth Structure. Post Operative Lesions. Bone infections—how applied in Antrum conditions. Facial Neuralgia and the possibility of using the mouth in administering treatment for systemic conditions.

10. Ultra Violet Rays in Dentistry

WALTER MAYLAND, D. D. S., and
GEORGE F. PURVIS, D. D. S., Chicago

A resume by the authors of positive and negative results over a period of four years. Practical demonstration of technique with dry skull; also report of comparative results in treatment of pyorrhea with and without air-cooled therapy.

Discussion of the foregoing two papers by W. A. Lurie, M. D., New Orleans.

11. Epithelioma of the Lip and Its Treatment with Radium

FRANK EDWARD SIMPSON, M. D., and
ROY EMMERT FLESHER, M. D., Chicago

The diagnosis of epithelioma of the lip. Methods of treating the lip lesion. Methods of treating the lymph nodes of the neck. Advantages and disadvantages of radium or radon treatment. Technic of treatment. Results.

Conclusions: Radium or radon in large quantities is the method of choice in lip epithelioma. The use of at least 1000 millicuries of radon is necessary for the best results.

Discussion opened by C. W. Hanford, M. D., Chicago; A. F. Tyler, M. D., Omaha, and Harold Swanberg, M. D., Quincy.

12. Electrocoagulation of Tonsils—Technic: End Results

GREGG A. DILLINGER, M. D., Pittsburgh
Electrocoagulation of tonsils in use in France for fifteen years or more in cases in which tonsillectomy is contraindicated. Results in over 200 cases. Technic very important factor. Certain features make it appeal to patient.

Discussion opened by Frank J. Novak, Jr., M. D., Chicago, and Raymond F. Elmer, M. D., Chicago.

13. Suction Tonsillectomy

J. B. H. WARING, M. D., Blanchester, Ohio

The operation, particularly from the standpoint of the physiotherapist. The proper equipment for this operation will be pointed out in more or less detail as also the proper usage of equipment in local and general anesthesia. Conclusions.

Discussion opened by Frederick L. Wahrer, M. D., Marshalltown, Iowa, and H. L. Brooks, M. D., Michigan City, Ind.

14. Diathermy in the Head Specialties

ELLIS G. LINN, M. D., Des Moines, Iowa

A helpful adjunct in acute head conditions, congestive and infective. Palliative and curative. Generally applicable. Valuable as rejuvenating factor in mucous membrane and submucous cellular structure atrophies. Supportive in actinic mucous membrane therapy. Treatments accurately delivered, not too prolonged, not too limited in contact area.

Discussion opened by Wm. A. Lurie, M. D., New Orleans.

15. Ultra Violet Ray in Asthma

H. B. WILMER, M. D., Germantown, Pa.

The importance of the use of ultra violet ray and the infra red ray in the treatment of asthma will be shown by report of a series of cases showing the different types and the method of treatment with the ray.

Discussion opened by A. R. Hollender, M. D., Chicago, and A. E. Schiller, M. D., Detroit.

JOINT SESSION

Friday, November 4th, 9 A. M.

1. Physical Therapeutics in Curriculum and Clinic

EDWIN N. KIME, M. D., Indianapolis, Ind.

Principles and methods of teaching: A. Undergraduate students of medicine; B. Post-graduate

students. (a) Internes and resident physicians. (b) Practicing physicians. C. Non-medical assistants: (a) Student nurses. (b) Lay assistants.

Discussion opened by Norman E. Titus, M. D., New York, and Disraeli Kobak, M. D., Chicago.

2. The Therapeutic Effects of Heat from Various Sources

JOHN HARVEY KELLOGG, M. D.,

Battle Creek, Mich.

Heat is one of the most potent and most generally applicable of all forms of physiotherapy. It is the dominant factor in most hydriatic applications, and an active element in many forms of phototherapy. Heat kills pain. For highest efficiency it must be applied in an intensive manner.

Discussion opened by J. E. G. Waddington, M. D., Detroit, and Frank T. Woodbury, M. D., New York.

3. Clinical Experiences with Artificial Sources of Light in the Handling of Complications of Pulmonary Tuberculosis

EDGAR MAYER, M. D., Saranac Lake, N. Y.

Physiological absence of light. Comparisons of Carbon Arcs and Mercury Quartz Lights. Clinical effects in lymphatic tuberculosis, intestinal and peritoneal tuberculosis, and laryngeal tuberculosis with technic of exposure as derived from personal clinical experience.

Discussion opened by Dean W. Harman, M. D., Ames, Iowa; R. T. Pettit, M. D., Ottawa, Ill., and Ellis Freilich, M. D., Chicago.

4. Massage—Principles and Practical Application (Illustrated).

CURRAN POPE, M. D., Louisville

The basic principles of massage will be treated as well as the mechanical methods of manual and mechanical massage. Lantern slides will be shown, giving a pictorial illustration of the movements and also massage of the various portions of the human body. The simplicity and value of this agent will be considered.

Discussion opened by F. H. Ewerhardt, M. D., St. Louis.

5. Muscle Training in Spastic and Flaccid Paralysis

JOHN S. COULTER, M. D., Chicago

Importance of attempts to drive motor impulses from brain to muscle. Massage and electricity should only be used in these cases with muscle training.

Discussion opened by Frederick H. Morse, M. D., Boston.

6. Phototherapeutic Facts and Fallacies

J. E. G. WADDINGTON, M. D., Detroit

Health depends upon a normal appropriation of a balanced spectrum. In disease, however, it may be necessary to increase or decrease the constituent proportions of the chemical, chromatic, and caloric ensemble. Superior clinical results demand a superior knowledge of the physics and physiology underlying all the integrant factors.

Discussion opened by W. E. Howell, M. D., Chicago.

7. Diathermic Penetration from the Clinician's Standpoint.

H. D. HOLMAN, M. D., Mason City, Iowa

Heat in relation to deep-seated lesions. Case reports. Equipment for conversive heat. Clinical work, in combination with the research laboratory, should enable us to select the best equipment. With heat playing such an important part in relation to the deep-seated lesions, it is readily seen why it is so important to establish the exact degree to which we get thermal penetration, by means of diathermia.

Discussion opened by S. C. Woldenberg, M. D., Chicago.

8. High Lights in the Past Year's Physical Therapy Literature

GEORGE B. LAKE, M. D.,

Editor Clinical Medicine, North Chicago, Ill.

Physical therapy has gone forward with a rush for the past ten years. The underlying reasons for developing niceties of technic are being investigated. Electrotherapy in its various branches continues to hold the center of the stage, and hydrotherapy, vibration, massage, mechanotherapy and therapeutic exercise are too much neglected. Portable apparatus of all sorts is rapidly being developed so that physical therapy can be taken to the patient's bedside. More space in all medical journals is being devoted to articles on physical therapy, which is taking its proper place as a part of scientific medicine.

Afternoon—2 O'Clock

9. Physical Therapy in Forms of Arthritis

WILLIAM BENHAM SNOW, M. D., New York

Diagnosis of types of arthritis. Traumatic arthritis. Its treatment by the static current. Arthritis of focal origin. First, removal of foci; then joint use of diathermy with the static current to remove infiltrations and fluids from the joint. Rheumatoid arthritis. As a rule of intestinal origin. Treatment by colonic irrigations, radiant light and heat and the static current. Conclusions.

Discussion opened by John Stanley Coulter, M. D., Chicago, and Chas. E. Stewart, M. D., Battle Creek, Mich.

10. Hypersensitiveness to the Action of Physical Agents, Such as Light, Heat, Cold and Mechanical Irritation

W. W. DUKE, M. D., Kansas City, Mo.

A rather large number of individuals become sensitive to the action of light, heat, cold, or mechanical irritants and highly sensitive cases react violently to relatively small doses of the agent to which they are sensitive. Patients of this class can be given tolerance for such agents so that they can stand normal exposures.

Discussion opened by Prof. Victor E. Levine, M. D., Omaha, and A. R. Hollender, M. D., Chicago.

11. The Measurement of Quantitative Biological Effects of X Rays

CHARLES PACKARD, M. D.,
Columbia University, New York City

The biological effect of x rays on the eggs of the fruitfly, *Drosophila*, is proportional to the intensity of the beam. Wave length (within the limits tested) is not important. The amount of effect is determined by the per cent of eggs hatching after exposure. This is remarkably constant under similar experimental conditions.

Discussion opened by Albert Bachem, Ph. D., and R. W. Fouts, M. D., Omaha.

12. The Effect of Ultra Violet Light on Food

PROF. VICTOR E. LEVINE,
Creighton University, Omaha, Nebr.

Physical and chemical effects of ultra violet rays on carbohydrates, fats and proteins, on enzymes and on vitamins. Irradiation of foods in general and of oils and fats in particular will be stressed, and special attention will be paid to sterols like cholesterol and ergosterol. Theory to show the relation between gastro-intestinal activity, calcium, absorption and ultra violet rays. Anemia, rickets, tetany, hypoacidity, and anacidity will be discussed in the light of theory.

Discussion opened by Prof. Arnold B. Luckhardt, University of Chicago.

13. The Transmission of Ultra Violet Light through Human Skin

PROF. ALBERT BACHEM,
University of Illinois College of Medicine, Chicago

Penetration of light through the skin not sufficiently well known. Increasing physiotherapeutic use of light in many diseases and increasing number of hypotheses to explain biological effects of the irradiation. The penetration was measured by use of a mercury quartz lamp, a Hilger Quartz Spectograph and a special photoelectric cell. The measurements were made with specimens of whole skin, isolated epidermal layers, Keratotic growth, subdermal fat, preparations of melanin, lanolin, earwax, blood serum, plasma, and finally fascia. Results and conclusions.

Discussion opened by Prof. A. C. Ivy, Northwestern University, Chicago.

14. Visual Teaching in Electrotherapy (with demonstrations and Lantern Slides).

RICHARD KOVACS, M. D., New York

Visualization of physics and mode of action of various currents essential for rational therapeutic application. Charts. Readily performed experiments and demonstrations with galvanic faradic, sinusoidal, diathermy and static currents.

Discussion opened by Edwin N. Kime, M. D., Indianapolis, and J. S. Coulter, M. D., Chicago.

HOSPITAL CLINICS

Cook County Hospital

Lutheran Memorial Hospital

American Hospital

Michael Reese Dispensary

Wesley Hospital

Northwestern University Medical School

Rush Medical College

The details regarding these clinics have as yet not been definitely arranged, but final announcements will be made in due time. The clinics will comprise work in practically all of the specialties and will be so arranged that conflicts will be avoided so far as possible. In order to facilitate matters, a clinic registration booth will be maintained at the meeting and only such numbers will be registered as can be conveniently accommodated.

Be Sure to Ask for a Certificate when Purchasing Your Railroad Ticket.

COURSE IN PHYSICAL THERAPY AT NORTHWESTERN UNIVERSITY MEDICAL SCHOOL

The Northwestern University Medical School of Chicago announces two intensive courses in Physical Therapy for Physicians of four weeks each, from October 3rd to October 29th, and from November 14th to December 10th, consisting of lectures, observation of cases, demonstrations of technic, clinics and the actual treatment of cases under observation.

The course is under the direction of John S. Coulter, M. D., and Prof. W. T. Bovie. The lectures will be given by the staff of the Northwestern University Medical School; the cases observed and actually treated will be at the school's clinic; and the clinics will be at the affiliated hospitals.

The requirements for admission are fellowship in the American Medical Association or membership in one of the state medical associations of the American Medical Association. The fee is \$150.00.

There will be lectures on the practical application of (a) galvanic and sinusoidal currents, (b) high frequency currents, (c) natural and artificial radiation, (d) thermotherapy, hydrotherapy and static currents, (e) massage, muscle training and mechanotherapy. Also clinics and lectures on the application of physical therapy in Orthopedic Surgery with special reference to fractures, Pediatrics, Medicine, Urology, Eye, Ear, Nose and Throat, Gynecology and Neurology.

Applications should be addressed to the Dean of the Northwestern University Medical School, 303 E. Chicago Ave., Chicago, Ill.

SECOND INTERNATIONAL CONGRESS OF RADIOLOGY, STOCKHOLM, JULY 23 - 27, 1928

The Second International Congress of Radiology will be held in Stockholm from July 23rd to July 27th, 1928.

The Congress will occupy itself with questions regarding Roentgendiagnosics, Radiotherapy (Roentgen-, Radium-, and Heliotherapy), Medical Electrology, Radiophysics, and Instruction and Training in Radiology.

Announcement of papers intended to be read at the Congress must be submitted before January 1st, 1928. A typewritten abstract of the paper in English, French or German, of not more than 400 words, one (1) page octavo, must be sent to the Secretary-General before April 1st, 1928. These summaries are intended to be printed and delivered to the members before the Congress.

If more papers are announced than can possibly be read, the Committee claims the right to limit their number in the interest of the Congress. Preference will be given to papers containing original work. Lecturers may not submit more than two papers. An address may not exceed 15 minutes.

Those who desire to be enrolled as members of the Congress are requested to forward as soon as possible the fee for Membership (40 Swedish Crowns) together with their names and addresses, to the Secretary-General, so that some estimate may be ascertained of the number of members attending, and arrangements made for their comfort and pleasure.

In connection with the Congress an exhibition will be arranged. Firms wishing to exhibit may obtain the necessary particulars and forms through the Secretary-General. Only those who have announced their intention of participating before October 1st, 1927, can be sure of obtaining space in the Exhibition Rooms.

Further particulars will be sent later. Only those who have already been enrolled as members can expect further communications.

All communications should be addressed to the Secretary-General, International Congress of Radiology, Sophiahemmet, Stockholm.

GOSTA FORSSELL, President.

AXEL RENANDER, Secretary-General.

THE STUDENT'S LIBRARY

BOOKS REVIEWED

DISEASE PREVENTION. *Herbert H. Waite*, M. D., Professor of Bacteriology and Pathology, University of Nebraska; Thomas Y. Crowell Company, New York. 667 pp. \$4.50 net.

The development of preventive measures is traced from the earliest times, in order to show that present day practices have been determined by eliminating the visionary and mystic and substituting for them rational methods based upon facts which have been scientifically established.

The historical material is excellently drawn from reliable sources. The more characteristic clinical symp-

toms of individual diseases have been included in the discussions. This, according to the author, has been done that the reader may gain some insight of their varied manifestations. Space is also devoted to the diseases caused by animal parasites. The book is intended solely as a digest "written especially for all those who have neither a medical nor an engineering background, and who would therefore, have some difficulty in securing information from original sources." In this respect, social workers, municipal officials and others engaged in occupations which have to do with fighting disease will no doubt find this volume of considerable value.

INTERNATIONAL ABSTRACTS

The Use of the Total Radium Rays in Small Doses in Chronic Metritis, G. Lacapere, Med. Jour. and Rec., April 6, 1927.

Chronic metritis is an obstinate condition and is refractory to treatment. It frequently necessitates the resort to operative measures, curettage, or the application of caustics. This latter procedure is apt to leave troublesome cicatrices. In chronic metritis radium yields better results than either curettage or caustics. The first trials of application of radium in cases of chronic metritis were made in association with Wichham and Emery. In these first attempts the radium salt was coated upon the cylinders and then covered with varnish; but by this method the radiations were difficult to measure, and the foreign body in the uterus set up active contraction until it was expelled. This

method was therefore abandoned for that of fusible pencils which melted at 37° C. (98.4° F.). These pencils contain six micromilligrams of radium bromide to which salts of uranium have been added; the uranium salts enhance the superficial radiations of radium; to this mixture of radium bromide and uranium salts the name of nitium has been given.

The insertion of nitium pencils into the uterus of women suffering from chronic, purulent metritis, causes a profuse discharge which lasts for two or three days. Microscopic examination of the first part of this flow shows the presence of large numbers of polynuclear leucocytes; which, owing to their greater mobility, are the first to respond to the chemiotaxic call of radium rays. A few hours later, only the slower mononuclear leucocytes will be seen. Still later, when the radium

pencil has been entirely melted, and washed away by the discharge, there will be no leucocytes, but just a copious discharge of mucus. This discharge also brings away vast numbers of microorganisms visible under the microscope.

The vitality and virulence of the microorganisms is not in any way impaired, as culture made before and again directly after the application of the radium, that is during the flow, has proven. No claim whatsoever of any antiseptic local action for radium rays can be made. It is simply a mechanical washing out almost exactly as in the operation of curettage, except that there is no destruction of the mucous membrane. The profuse discharge of mucus floods the microorganisms out of the gland ducts and from the surface.

After two or three days the discharge ceases and marked diminution will be noticed of the glairy mucus which so commonly is seen issuing from the cervix. Three or four applications usually suffice to bring about a cure, but even in obstinate cases five or six will generally effect a cure. This method of treatment in no wise affects the normal functions of the uterus. It does not interfere with menstruation and sets up no reactions. When acute salpingitis is present the nitium may set up some congestion of the Fallopian tubes, while this congestion has not been sufficiently great to be dangerous. It is better to abstain from the use of this method while the process in the Fallopian tube is active.

Nitium can also be used in the form of ovules or vaginal suppositories, and yields fine results in the vaginitis which so frequently accompanies the metritis, and which has its seat in the fornices of the vagina.

Ulcerations of the cervix yield promptly to this treatment; in fact, all chronic ulcerations are favorably influenced by the topical application of this form of radium, even the chancrous types.

Deep Roentgen Ray Therapy in the Treatment of Carcinoma of the Bladder, Charles A. Waters, J. A. M. A., Nov. 13, 1926.

According to Waters, experience up to this time would seem to warrant the following conclusions.

1. The best treatment for superficial papillary carcinoma, whether localized or extensive, is a combination of deep roentgen ray therapy with applications of radium applied directly to the surface of the growth. Radium alone has been very successful in handling this type of case, but frequently so much radiation is required that the destruction of the tumor is followed by a severe radium ulceration. In our experience, the

results obtained by the combination of deep roentgen ray with radium are better when the tumor has received from 600 to 800 milligram hours of radium before the roentgen ray treatment is started.

2. By the combination of radium with roentgen ray treatment as outlined, most of these tumors can be destroyed with a minimum amount of injury to the bladder, and in many instances with but little or no irritation of the bladder mucosa.

3. When the growth is an infiltrating carcinoma, though still operable, we believe that radical resection should be carried out, since it offers the greatest chance of complete cure.

4. Twenty-five per cent of the infiltrating growths in our series occupy positions that render them inoperable, or they are so extensive that radical removal is impossible. In this group, when it is possible to apply radium directly to the growth, both radium and deep roentgen ray treatments should be given a trial, for in a certain number of cases favorable results can be obtained by this method alone. But in cases in which this procedure does not yield results hoped for, or in cases in which one feels that the growth is sufficiently localized to warrant implantations of radium needles, the bladder should be opened suprapubically, and screen radium needles should be implanted throughout the growth. But if the growth is so extensive that a total of more than 2,500 milligram hours is necessary, in order thoroughly to destroy the cancerous areas by implantations, this method should not be considered. Within the last few years, diathermy has been used in a number of clinics. Our experience with this form of therapy is too recent to warrant the drawing of any definite conclusions.

5. Finally, the great tendency to recurrence of tumors of the bladder, following their apparent destruction by fulguration, irradiation or deep roentgen ray treatment, makes it imperative that patients return at frequent intervals for cystoscopic examinations. In at least five of our patients, in whom recurrences ultimately resulted in death, complete cures might well have been obtained had they returned regularly for observation and treatment before the recurrences had become too extensive. In a few cases in which the patients have returned for observation, the recurrences, when found, have responded well to radium alone. This is especially true of the noninfiltrating papillary carcinomas. Even in cases that are incurable, regardless of the treatment employed, deep roentgen ray treatment is an excellent palliative measure, in that it tends to control hemorrhages and to decrease nerve root pains.

Skin Reactions to Ultra Violet Rays, E. and H. Biancani, Paris Medical, Jan 15, 1927, (abst. J. A. M. A., April 9, 1927.)

Acute inflammation is the most frequent skin lesion from the therapeutic use of ultra violet rays. It develops in persons with a special sensitiveness and sometimes appears in a region beyond that exposed. Repeated irritations of the skin by the rays causes chronic lesions, a precancerous dermatitis. Sunburn, freckles, eczema, hydroa, keratosis senilis and xeroderma pigmentosum are manifestations of the reaction of the skin to the ultra violet rays of the sun. The effect of ultra violet rays is reduced by association with red or infra-red rays. It is less pronounced in dark skins, namely in brunettes or in members of the colored races. Certain substances, such as eosin, hematoporphyrin or acridin, on being introduced into the organism render it more sensitive to the sun's rays (photosensitization). The phenomena of pellagra may possibly be due to photosensitization, the cereal toxin causing the sensitization. Medicinal eruptions and possibly eruptions in infectious diseases can be ascribed to photosensitization. Hepatic insufficiency occasions appearance in the blood of photosensitizing substances, such as acid-amines, tyrosin and tryptophan. Hyper-sensitiveness to rays is observed sometimes in tuberculous persons and in pregnant women. Irritation of the skin from ultra violet rays can be averted by applying quinine ointment or a soap containing sodium naphthosulphate. Applications of tannin incorporated in petrolatum or alcohol (1:10) are effective. In case of photosensitization, resorcin is indicated. Exposures repeated at short intervals may possibly immunize the skin against morbid irritation from rays.

Studies on the Effect of Roentgen Rays on Glandular Activity & The Effect of Roentgen Rays on External Pancreatic Secretion, B. H. Orndoff, M. D., J. I. Farrell, M. D., and A. C. Ivy, M. D., The Am. J. of Roentgenology and Radium Therapy, Oct., 1926.

Since the pancreas produces a very important external and internal secretion, and since roentgen rays are being directed into the upper abdomen for therapeutic purposes, it is important to know the effect of various doses of roentgen rays on the functions of this vital organ.

The methods employed by these workers are described.

Summarizing their results, they state: The effect of three different doses of roentgen rays upon the secretion of the pancreas has been studied in dogs prepared

with a chronic fistula of a portion of the pancreas so placed that it alone was exposed to the action of the roentgen rays.

In one experiment one-tenth of a human erythema dose increased the concentration of lipase and trypsin, but did not affect the quantity of the secretion. In two animals one-half of a human erythema dose increased the quantity of the secretion and the total output of ferments. In a third animal this dose increased the quantity of secretion and total output of ferments the first week after exposure, following which the quantity of secretion and the total output of lipase was decreased and the total output of trypsin remained normal. One human erythema dose decreased the quantity of secretion and total output of ferments in two animals for two weeks after exposure. One animal returned to normal forty-seven days after exposure, the total output of ferments being greater than normal. It has been pointed out that although the pancreas may be temporarily injured by one human erythema dose its power to regenerate may compensate for the injury.

Roentgen Ray Treatment of Inoperable Carcinoma of Urinary Bladder, Henry Schmitz and Joseph E. F. Laibe, J. A. M. A., Nov. 6, 1926.

From January, 1915, to April, 1925, fifty-three cases of clearly inoperable and advanced primary carcinomas of the urinary bladder were treated with three different methods: twenty-one cases with radium; nineteen with a combination of cautery and radium or roentgen rays, and thirteen with roentgen rays only. The rapid and complete arrest of the growth and the subjective relief of a large number of the patients treated with the roentgen rays was so remarkable that it was deemed of value to render a report comprising the clinical observations made and a comparison of the results of treatment with the three methods employed.

The main facts of this paper are given in the following summary:

1. From a clinical study of the action of radium, cautery and roentgen rays in extensive and clearly inoperable bladder carcinomas, we must conclude that the short wave roentgen ray applied according to modern methods of technic is an efficient therapeutic agent to arrest the cancer growth and restore the function of the bladder to normal

2. The good results obtained with short wave roentgen-ray treatment may be ascribed to: (a) the homogeneous penetration of the cancer bearing area with a known roentgen-ray dose; (b) the radiation sensitiveness of the cell types composing the bladder

cancers, and (c) the absence of trauma and local irritation in roentgen-ray therapy.

Experimental Study of Diathermy, R. C. Lonergan, Jour. of Industrial Hygiene, January 1927. (Abstract J. A. M. A., March 19, 1927.)

Lonergan records the results of a series of experiments made for the purpose of showing temperature changes after the application of diathermy. He says that the moderating effect which the normal circulation of the blood must exercise in preventing the local accumulation of heat must always be prominent. Any process that interferes with this normal state could account for a temperature elevation beyond the usual limits. Lonergan's records failed to disclose a notable elevation of the deep temperature in the thoracic cavity of the normal animal, and it appears doubtful that a marked elevation could be obtained in the well circulated pneumonic lung. Joints should prove better regions for the accumulation of heat, because they do not receive so active a circulation as that found in other organs. After diathermy, however, the elevation of the local temperature in joints is noteworthy. It was observed that a difference in temperature of nearly 5 degrees F. was attained after a diathermy treatment of the knee joint. The location of the joint, its surface anatomy, and the mode of application of the heat are all factors which greatly modify a local increase in temperature, and in these experiments the additional factor of an operation on the joint must be considered. Lonergan was unable to detect a temperature increase after diathermy above that which could be obtained from other sources of external heat. The question of possible injury to tissues in the treatment of patients by diathermy is one to be considered carefully. Diathermy is a form of electrical energy that is not well understood. It is a powerful agent, apparently capable of causing gross injury, and by virtue of this fact must be used with caution. The control offered in the patient's subjective response represents a safety barrier and one that should not be forgotten. Tissue injury must result from the application of any form of heat beyond the endurance of that tissue. One may assume that with diathermy the heat is subject to a more accurate control and it is more evenly and uniformly distributed than in the application with hydrotherapy, massage and electrical baking devices. It may therefore secure a greater penetration, yet the factors which govern and control its distribution must obtain here as in other methods of heat application. The indiscriminate use of diathermy is discouraged.

Histologic Studies on Endocrines of Chickens Deprived of Ultra Violet Light; I Parathyroids. J. F. Nonidez and H. D. Goodale, Am. J. of Anatomy, Jan. 1927, (Abstract, J. A. M. A., March 26, 1927.)

Nonidez and Goodale noted that the combined effect of a lack of direct sunlight and a ration poor in antirachitic vitamin on the parathyroids of growing chicks is expressed in enlargement of these glands. Microscopic examination of the glands shows that this enlargement is due to increase in cell size (hypertrophy), and increase in numbers of the epithelial cells (hyperplasia). The phase of hypertrophy and hyperplasia is followed by a phase of regression during which the epithelial cords appear shrunken. Shrinkage of the cords may coincide with hyperplasia of the stroma. Local degenerative changes, such as production of keratin and mucous degeneration, were present in the regressive glands of some of the chickens examined. It is suggested that these phenomena are not the immediate result of the treatment, but are caused by some other factors of unknown nature, and that degenerative tendencies are probably favored by the abnormal condition of the glands. The parathyroids of chickens that are deprived of ultra violet rays for five weeks and subsequently exposed to direct sunlight are much smaller than the corresponding organs in younger birds not receiving exposure. Microscopic examination shows that the decrease in volume of the glands is due to a decrease in cell size resulting in considerable crowding of the epithelial cells. Pressure atrophy also occurs in some of the glands.

Indications for X Ray Treatment in Uterine Fibroids, Pierre Lehmann, Journal de Medicine de Paris, Nov. 29, 1926.

This author is in favor of the x ray treatment because of the fact that it permits to a maximum degree of sparing the physiological functions of the ovaries and is free from mortality. On the other hand the surgeon is able to inspect the parts, and not infrequently finds such complications as cystic degeneration or neoplasm which had not given any clinical signs of their presence. Operation should be preferred where the diagnosis of fibroids is not obvious and in fibroids developing after the menopause, which are seldom pure fibroids. Febrile movements in a case of fibroids contra-indicate the x ray. A fibroid which enlarges rapidly should be operated. Pedunculated, subperitoneal or submucous fibroids are not improved by the x ray. The latter is especially indicated where the hemorrhagic factor predominates; likewise, where the patient's general condition contra-indicates operation and in stout wo-

men, in whom the operation is more difficult and its results often poor. There are other cases in which the indications for x ray treatment are less definite. Such cases should be closely watched and examined periodically after the conclusion of treatment. A tumor which is larger than before two weeks after irradiation is not a fibroid and should be promptly operated. A febrile movement and abdominal symptoms after irradiation suggest an adnexal reaction and call for operation. If, after two irradiations, a patient develops hot flashes and signs of the menopause, but still has bleeding, a submucous polyp should be thought of and curettage performed to stop the hemorrhages. In Faure's clinic, about forty per cent of fibroid cases are treated with the x rays and the remainder dealt with surgically.

Treatment of Inflammatory Adnexal Diseases by Roentgenotherapy, L. Schoenholz, Zentralblatt für Gynaekologie, Sept. 18, 1926.

Three types of roentgenotherapy are available in the treatment of inflammatory adnexal diseases: 1, roentgen castration; 2, temporary castration; 3, shorter irradiations, which usually affect younger women, permanent castration need not be considered; it should be reserved for older women or those just before the menopause.

Septic conditions are contra-indications for this treatment. Inasmuch as gonococcal and tuberculous infections destroy fertility, roentgenotherapy is indicated, and the effect of castration need not be considered. The tuberculous adnexitides are especially well suited for this treatment. If the gonococcal infections do not respond to the usual methods of treatment, roentgenotherapy is indicated.

The clinical results obtained by the author certainly deserve to be considered. With simple tuberculosis of the adnexae, a complete cure can be secured in about fifty per cent of the cases. Surgical treatment gives equally good results, but is inferior to roentgen irradiation because, as is usually the case, the adnexal tuberculosis is associated with tuberculosis of the peritoneum. In such cases roentgenotherapy is preferable. In the judgement of the end result in tuberculous adnexitis, we must also consider that this is frequently associated with intestinal and pulmonary tuberculosis. Even though these cases show poor results as regards a permanent cure, roentgenotherapy is preferable especially here because it is not associated with a primary mortality and because the tuberculous process is favor-

ably influenced through placing the ovarian activity at rest by eliminating the frequently existing menorrhagias and metrorrhagias.

Über Die Elektronenemission Fester Oberflächen in Abhängigkeit vom Material Des Strahlers und der Qualität der Erregenden Roentgenstrahlen, H. Holthusen and O. Ascher, Acta Radiologica, Vol VIII, Fasc. 1, 28:II 1927, N:0 41.

1. The author deals with the theoretical aspect of the intensity of secondary electronic radiations from hard metallic surfaces in relation with the quality of the roentgen rays and the material of the radiating layer in consideration of the laws of absorption.

2. The consideration of the laws of absorption, including the absorption of scattered rays, emission of characteristic and the geometrical conditions under which measuring takes place, allows definite conclusions to be drawn as regards the dependence of electronic emissions upon the different experimental conditions.

3. The results obtained by measuring the wall-emissions from different metals (Al, Fe, Cu, Ag, Sn, W, Pb) excited by rays of λ eff. = 0.9 to 0.12 A. E. agree with the conclusions arrived at by theoretical reasoning.

The following points are particularly to be noted.

- a. an increase of the wall emission proportionate to the cube of the effective atomic weight in the case of lower atomic weight of the cathodes and short wave-lengths.
- b. a retardation of the electronic emissions beyond the value estimated from the accepted formula this side of K-limit, increasing with the wave-length and the atomic weight of the metallic radiator.
- c. by altering the quality of the rays the electronic emissions from a given metallic radiator pass through a maximum value that with increasing atomic weight of the cathode examined becomes more and more shifted towards the side of short wave-lengths.
4. If roentgen rays of decreasing wave-lengths act upon metallic surfaces, the maximum value of electronic emissions is only found in examining the electronic emissions in air. On examining the effect of electronic emissions from metallic surfaces upon a photographic plate, it will be found that the blackening obtained by the electrodes increases with the hardness of the beam.

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